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# Central-Station Rates in Theory and Practice

## First Article of the Series—Various Kinds of Costs—General Principles by Which Service Costs Can Be Determined—Application to the Cost of Electric Service


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*This is the first article of a series to appear weekly throughout this volume. A general outline of the entire series was published in the last issue. Rates for electric central-station service are generally conceded to be more scientifically and equitably developed than for any other class of public utility service. The principles on which they are based are applicable to many other kinds of service and yet they are not well understood by many public authorities, by the public in general, and even by many electrical utility managers. Mr. Eisenmenger's articles will therefore be found of great value, especially at the present time when rates are in so many cases being revised.*

### PART I—THE COST OF ELECTRIC SERVICE.

#### 1. The Cost of Commodities in General.

A. THE COST OF A CERTAIN QUANTITY. TOTAL COST AND UNIT COST.

SECTION 1. The term "cost" of a certain commodity[1] is by no means a well defined one and we must distinguish a variety of interpretations.

In the first place, the term "cost" always refers to some given quantity of the commodity and it is usually—though not always—understood from the context what quantity we mean. It may be the total quantity produced (sold, consumed, etc.) in a certain enterprise, for instance per year, or the quantity purchased or consumed by a certain consumer, or the quantity of a certain shipment, etc.

Primarily, as a rule, we have given the cost of the total quantity produced, mostly per year, and desire to know the cost of the quantities purchased by the various consumers, or of other quantities of the commodity. For this purpose it is necessary to reduce the cost to some unit quantity.[2]

The term "cost" means therefore the cost of a given quantity, which may or may not be the unit quantity. Thus the cost of coal may be said to be $1000, which may mean per year, or per shipment, or per voyage of a steamer, etc., or the same cost may be said to be $4, which would mean per ton.

To avoid such ambiguities, the cost of a certain quantity, other than unity (especially the quantity produced, sold, consumed, etc., by a certain enterprise during a year or other unit of time) will hereafter in these articles be called the "total cost" where necessary to distinguish it clearly from the "unit cost," that is, the cost per unit quantity.

Where we have a number of constituent quantities, for instance several classes of service, the cost of producing several of these quantities simultaneously will be called their "combined cost."[3] We can thus distinguish a total combined cost and a unit combined cost. If the constituent quantities comprise all parts of the quantity produced by the manufacturing enterprise, for instance in a year, the combined total cost will be called the "aggregate cost" in these articles. This is the entire (annual, monthly, etc.) cost of the enterprise.

The same distinctions as to the quantity of the commodity must be made in case of income, profit and price, so that we distinguish a total income, profit and price and a unit income, profit and price.[4]

B. COST INCLUDING OR EXCLUDING CAPITAL EXPENSES.

2. We can further distinguish different kinds of cost for the same commodity, or different meanings for the term "cost" as explained in the following:

The total annual cost necessary to maintain and run any enterprise, especially a manufacturing establishment, such as a central station, consists of two parts:

(a) The direct running expenses per annum which generally stop as soon as the enterprise shuts down, such as salaries, wages, fuel, raw materials, etc.

(b) Expenses which are the result of a certain capital being invested in the property of the enterprise.

[1] The term "commodity" is meant throughout these articles to designate anything that is being sold, whether physical goods, or the right to use them, or work, labor, service, etc.

[2] The unit to be chosen depends on the nature of the commodity. It may be, for instance, a unit of weight, length, area, cubic capacity, numbers (pieces, pairs, dozens), time, power, energy, weight-distance (ton-miles in transportation service), etc.

[3] The "combined cost" is not equal to the sum of the costs of the constituent quantities (see later).

[4] If the commodity consists in a service, the price per unit is frequently called the "rate"; electric service, for instance, may be charged "at the rate of" 10 cents per kilowatt-hour, just as we say, a train is running "at the rate of" 50 miles per hour.

This capital calls not only for interest but also for annual payments into funds for depreciation, etc.[5] These expenses remain the same whether the plant is working or not. They are not reduced if the plant reduces its output, but they are increased if the plant increases its output beyond its present capacity.

We can now call "cost" the aggregate of all of the above expenses under (a) and (b), assuming a fixed percentage of net return on the capital invested. This method is the obvious one where the capital has been raised entirely by bonds and therefore bears a fixed interest, as in the case of municipal plants. With this meaning applied to the term "cost," it is only necessary to cover the "cost" by the revenue, and no profit[6] is required to yield the expected return on the capital invested. If the gross revenue exceeds the total cost, the balance representing the profit must be applied to purposes not in direct connection with the enterprise, unless we can reinvest it for enlargements, etc.

Or we may understand the term "cost" in such a manner that it includes the running expenses (a) and only such of the capital expenses (b) as are actually a fixed percentage of the capital invested and independent of the earnings, that is, interest on bonds and on preferred stock, also depreciation charges, etc., but not the interest on the common stock ("dividend"). In that case it is necessary that the enterprise should yield more than the "cost." The variable excess of the income over cost, that is, the profit, is applied to pay the interest on the stock. That interest, the dividend, is therefore a variable percentage.

Or we may finally exclude *all* the capital expenses (b) from the amount covered by the meaning of the term "cost," so that we will have to pay out of the profit, first the fixed capital charges, such as bond interest and depreciation charges, and then apply the balance for the dividend.

Where the term "cost" is applied in these articles without further specification it will always be understood in this last sense.

In all these cases we can again distinguish a total cost of the establishment, for instance per year, and a unit cost as explained under Section 1.

### C. Segregate Cost, Increment Cost, and Average Cost.

3. Another lack of definition in the term "cost" is that it may mean what will be called in these articles the "segregate cost," or it may mean the "increment cost" or the "average cost." The segregate cost of a certain portion of the total quantity produced by the enterprise is the amount it would cost to produce that fractional quantity only. The increment cost is the amount by which the aggregate cost of the enterprise is increased in consequence of the fact that the respective quantity is added to the quantity to be produced.[7] Both the segregate cost and the increment cost can be reduced to the unit produced.

[5] Interest, depreciation, and other capital expenses will be treated more fully in Sections 18 to 23.

[6] Profit is the excess of income over cost and the meaning of this term varies therefore as we apply the different meanings of the term "cost," as explained in this section.

[7] It is a general, and probably universal, truth that a larger establishment can—ceteris paribus—produce more cheaply per unit than a smaller one and an establishment of given size can produce more economically if it is producing at a rate corresponding to its full capacity than otherwise. If we have, for instance, a railway where the traffic is so small that not more than one or two trains are necessary in each direction per day, we have certain salaries for station masters, etc., to pay, just the same as if we had many more trains; a certain capital must be invested in the roadbed and buildings, independent of the number of trains running daily; the wooden ties will rot in the same time whether many or few, heavy or light trains are running over them, etc.

Supposing, for the sake of an example, that it costs

\$ 600 to produce 500 units,
1000 to produce 1000 units,
1300 to produce 1500 units,

then the increment cost of 500 units over the cost of the first 500 units is \$400, and the increment cost of 500 units over the cost of the first 1000 units is \$300. The segregate cost of 500 units, that is, the cost of producing the said quantity by itself without simultaneously producing other units, is \$600.

Both the increment and the segregate cost can be reduced to the unit. The increment cost per unit in the above example would therefore be \$0.80 or \$0.60, respectively,[8] whereas the segregate cost per unit would be \$1.20.

We can finally also reduce the aggregate cost (see Section 1) to the unit, that is, we find the "average cost per unit." This would be in the above example in case of an aggregate production

of 500 units.....\$ 600/ 500 = \$1.20
of 1000 units..... 1000/1000 = 1.00
of 1500 units..... 1300/1500 = 0.867

### D. By-Products.

4. Conditions frequently are not as simple as assumed so far. The first complication comes in where more than one commodity is produced by the respective enterprise. The same processes, activities, capitals invested, etc., which are necessary to produce one commodity, frequently automatically produce at the same time another one or several others. In the coal-gas business, for instance, the result of the process is not only gas, but also coke, tar, ammonia, naphthaline, etc. If one of the commodities is of paramount importance we can speak of a *main product* and of one or more *by-products*, in the sense of subordinating the latter to the main product. Or, if all the products are more or less of the same importance among one another, we can call them all by-products, meaning by-products to each other, in the sense of mutual co-ordination.

Now, the question arises: What portion of the total cost, or of any part of the total cost, is to be charged to every one of the by-products?

What portion of the annual cost of coal, for instance, is to be charged to the cost of the gas and what portion to the cost of the coke?

We cannot distribute the cost according to the number of the units produced of each commodity, because gas and coal are not measurable in the same units, and even if they were, it would not be possible to logically justify such a distribution of the cost. We might distribute the total cost according to the selling value of the totals produced of gas and coke and then, if the unit cost is required, further distribute each one of these subdivisions to the uint of gas or coal respectively. Or we may prefer some other way. Whichever method we choose, there will always be an arbitrary element about it.

It may be anticipated here that this does not apply to the *prices*, which are determined according to the value-of-service principle. This will be discussed in a later section on prices.

### E. Products to Be Measured in More Than One Unit.

#### 1. *General Explanation.*

5. Another complication in determining the cost per unit is encountered where the total cost consists of

[8] Frequently the conditions are such that we can assume the increment cost per unit to be constant for a wide range of the quantities of previously produced goods.

several portions or items in such a manner that the amount of each portion is determined by some other factor or element and each of these factors is measured in another unit. For instance, one portion or item may depend on the weight of the commodity produced (expressed in pounds or tons, etc.) and another one on the length of the same product (for instance in feet). Instead of theoretical explanations an example will make clearer what this means.

**6.** This example is the letter carrying service as furnished by the Post Office Department. The annual cost of the letter mailing service (excluding the charges on the capital invested) is composed of the two following main portions or items:

(a) The annual cost of transporting the letters, whether by rail, or street-vehicle, or on the shoulders of the postman.

(b) The annual cost of assorting and distributing the letters in the post offices.

The first item, like the cost of any other transportation service, can be assumed to be proportional to the number of ton-miles required per year, and in reducing the cost to the unit we have to use the ton-mile (or ounce-mile or some such unit). This item will therefore be constant *per ton-mile* (or ounce-mile). The second item is plainly the larger, the larger the *number* of letters is that is being handled per year and has practically nothing to do with the weight of the letters or the distance over which they are being carried, etc. The proper unit is the letter or a certain standard number (say, 100, 1000) of letters and this item will be *constant per letter.*

The total cost for any volume of service rendered during any period of time is therefore the sum of two items, one of which is the product of a constant figure $\times$ the number of ounce-miles required, whereas the other is the product of another constant figure $\times$ the number of letters carried. This applies to any volume of service, to individual letters as well as to a given mail bag filled with letters, etc. The result of the computation will be correct, no matter whether we have big, fat manuscripts or thin, little notes and whether they travel from New York to San Francisco or into the neighboring town only.

### *2. The Use of a Smaller Number of Elements Simplifies the Computation, but Reduces the Accuracy.*

**7.** The question of the average unit cost of letter service will therefore be answered as: So much per ounce-mile plus so much per letter. We can, however, also refer the total cost of letter service to one of the two above elements only and ask: How much is the average cost per letter? Or: How much is it per ounce-mile? This is easily figured out, but if we try to apply it to a given letter or portion of service (mail bag) it will furnish correct results only if in that letter (bag of letters, etc.) the ratio of the ounce-miles to number of letters happens to be the same as in the entire service over the whole year. If we apply, for instance, the average figure per letter to a very thin letter traveling over a short distance, the computation will furnish too great a value because we figure the cost as if the letter would require a greater number of ounce-miles than it actually does. Conversely, if we apply to such a letter the average figure per ounce-mile the result will be too small, etc.

### *3. The Use of a Greater Number of Elements Enhances the Accuracy, but Complicates the Computation.*

**8.** We have now obviously a certain inaccuracy, not only if we reduce the cost to a single one of the items, but also in the case where we use both of the above items (cost of transportation and cost of handling) since these items are not really the only ones (as has been assumed so far) which have a bearing on the cost of service, even though they are the most important ones. We have to correct, therefore, the statement made above in Section 6 and say: "The first item (a) is *practically* constant," or "nearly constant," or "does not vary much" per ounce-mile, and the same correction applies to item (b) per letter or per 1000 letters, etc.

We can, therefore, increase the accuracy by increasing the number of "elements" or "items" (cost of transportation and cost of handling in the above example) which we choose to consider for the computation of the cost. We might use, for instance, three items: (a) the cost of transportation between railway stations or ports (per ounce-mile); (b) the cost of transportation within the distance of a given post office, that is, from the letter box to the post office, between the post office and the railway station and from the post office to the addressee (per ounce-mile); and (c) the cost of handling the letter.

Whether we select from the indefinitely large number of these elements one, two, three, or four, etc., and where we draw the line between the most important ones and those of lesser importance, is to a certain degree a matter or abitrary judgment, and the decision will have to be guided by considerations of practicability. *The larger the number of elements we choose, the greater will be the accuracy and the smaller will be the deviations in the individual case.* At the same time the computation will become more complicated. We have to strike in this case (as in so many others) a happy medium, and steer a safe course between the Scylla of complication and the Charybdis of inaccuracy.

### *4. Increasing the Accuracy With a Given Number of Elements by Subdividing the Customers Into Classes.*

**9.** We can, however, with a given number of elements chosen, increase the accuracy with less complication in the following way. We subdivide all the customers or all the cases in which the respective business is transacted, into a number of classes or groups, selected in such a manner that the unit cost of each one of the considered items—that is, of ounce-mile and letter in our case—is most nearly constant for all customers or parts of business within each group, but varies from one group to another. For instance, we might classify the letters according to the distance over which they are carried into local, interurban or domestic, and international letters. Then the answer to the questions, "How large is the cost per letter?" or "How large is the cost of transportation per letter?" will be more accurate, that is the individual deviations from the average will be much smaller. The average cost per local letter will be one figure, per interurban another, and per international a third one. Or we might classify the letters according to their weight: or according to the location of the addressee into the three classes of rural, suburban and business district letters. The transportation charges for the rural letters will be higher than in the other classes because the letter-carrier has to walk a longer distance from the post office and between the houses, etc. We may, of course, also combine two or more of these classification systems and differentiate heavy and light rural letters, heavy and light suburban letters, etc.

Employing this principle, we can increase the accuracy with less inconvenience than when we employ an additional item.

## II. The Cost of Electric Service in Particular.

### A. The Three Elements of Cost.

**10.** The problem of properly expressing the unit cost of electric service can be solved in an entirely analogous manner to that previously described.

Just as we can say, the cost of letter service is so much per ounce of letter, we can also say electric service costs the central station, for instance, 3 cents per kilowatt-hour. That would mean that it costs 3 cents to furnish the current for burning a 100-watt lamp for ten hours or for obtaining one horsepower during one hour at 74.6% motor efficiency, etc. This is certainly a very clear and simple statement of the unit costs, but unfortunately it does not tell us much, unless we know the exact conditions under which the current is being furnished. It tells us no more than if we hear that it costs the Post Office Department one cent, or some such figure, to transport, handle and deliver a letter or one ounce of letter, without any statement about the distance over which the letter is to be carried or about the weight of the individual letter, etc. Yet we frequently read statements of the cost of electric power in terms of kw-hr. They are worth anything only if the special conditions of the case are known. They give over-all averages only. It may cost the same central station ½ cent per kw-hr. to serve one customer and 10 cents or more to serve another.

In accordance with what has been shown in the example of the letter service, we would have to have a large number of elements which have a bearing on the cost of the commodity selected, in such a way that a certain portion of the total annual cost of the central station is proportional to the number of units per annum of one of the elements, another portion to the number of units of another element, and so on. In order to avoid too great a complication and to get practicable results, we generally limit the number of these elements to three, and more or less neglect the rest as they are of lesser importance. More accurately speaking, we average the small remaining part of the total cost which is not proportional to any of the three items of cost, *somehow* into the three items.

(The reader should keep in mind that we are at present dealing with the cost to the central station and not yet with the systems of charging the consumer.)

The three items for the computation of the cost are:

(1) An item proportional to the number of kilowatt-hours generated or sold.[1] This item is therefore constant per kilowatt-hour. It is called the kilowatt-hour cost or *energy cost.*

(2) An item proportional to the maximum number of kilowatts[2] loading the central station. This item is therefore constant per kilowatt; since the maximum power in kilowatts is called the maximum demand, this item is called the *demand cost.*[3]

(3) An item which is caused by the mere fact the consumer *is* a customer of the central station. This item is independent of the amount of service required by the customer, as the second item in the example of the letter-mailing-service cost (assorting the letters) was independent of the weight of the letter and of the distance over which it had to travel. This item of central-station cost is proportional to the number of customers and is constant per customer. It is called the *customer cost.*

These three items will be discussed more in detail in the following installment.

### Insert 1—(Appendix to Section 10).

Explanation of the Terms "Horsepower," "Kilowatt," "Kilowatt-hour," Etc.[4]

If a weight is lifted up by some force it requires "mechanical work" to do this, and if it is lowered mechanical work is set free. Work is measured in foot-pounds, which means the unit of work is the foot-pound. A foot-pound is the work necessary to lift one pound one foot high. To lift 1 lb. 2 ft. high 2 ft.-lb. are necessary, and to lift ½ lb. 2 ft. high, evidently one-half of that amount is necessary, namely 1 ft.-lb. In the same way we can say, one foot-pound is the work necessary to lift 10 lb. 1/10 ft. high, or 1/100 lb. 100 ft. high, etc. It is seen from these examples that the work is given by the product, force × distance.

The rate at which work is being done is called *power.* Power is the work done *per second.* It could be measured in foot-pounds per second, but this unit is inconveniently small for the purposes of the engineer and therefore a unit has been chosen which is 550 times greater, or which, in other words, amounts to 550 ft.-lb. *per second.* It is called the *horsepower* (hp.). A horsepower is, therefore, the power of one pound falling 550 ft. *every second,* or, for instance, 100 lb. falling 5.5 ft. every second. Conversely, 1 hp. would be required to lift 100 lb. 5.5 ft. every second. A water fall, for instance, which pours 880 cu. ft. (55,000 lb.) of water *every second* over a head of 100 ft. would, if harnessed, be able to produce 10,000 hp. (provided that no power would be lost in the turbines).

The electrical engineer uses other units besides the horsepower: the *watt,* which is about 0.738 ft.-lb., and the *kilowatt,* which is 1000 times as great as the watt. A kilowatt is, therefore, the work done by 1 lb. falling 738 ft. *every second.* One kilowatt = 738/550 = 1.342 hp. and one horsepower = 550/738 = 0.746 kw. The kilowatt, the watt and the horsepower are, therefore, different units for the same thing, just as the mile, the inch and the kilometer, or the dollar, the cent, and the shilling are different units for the same thing.

One kilowatt produces 738 ft.-lb. every second, or 2×738 =1476 ft.-lb. in two seconds, 2214 ft.-lb. in three seconds, etc., and 7380 ft.-lb. in 10 seconds. We can also obtain the same work of 7380 ft.-lb. from 10 kw. and then it will take us only one second, instead of ten. We see that the work is given by the product of power × the time during which the power is being applied.

We have thus been moving in a circle. We have seen that if a certain work has to be done within a given time—

[1] Not all the kilowatt-hours generated are sold. Some of them are used for the home consumption of the central station and others are lost in the transmission to the consumers. But the kilowatt-hours generated and sold can be assumed to be proportional to each other and it does not make any difference whether we assume the energy generated or sold to be the basis of the computation of cost and, in the first case, whether we include the home consumption or not, as long as the units are consistently understood in the same manner. Where it comes to the computation of cost as a basis for the price to be charged to the costumers it is evident that the energy sold is to be taken into consideration only.

[2] The non-technical reader whose ideas about the difference between the meanings of the terms "kilowatt" and "kilowatt-hour" are not quite clear is referred to Insert I.

[3] Some of the readers who are not familiar with electrical engineering may find it useful to have the difference made clear between the first and second item in plain though quite unscientific terms as follows: Imagine a lighting installation with lamps all of the same size. Item (1) of the cost, the energy cost, is proportional to the number of kilowatt-hours, that is, in this case to the number of lamp-hours. (The term "lamp-hours" means the sum of the burning hours of the individual lamps.) Item (2), the demand cost, is proportional to the maximum number of kilowatts (or, what amounts to the same thing, to the maximum number of watts) drawn by the consumer at any time, that is, in our hypothetical case proportional to the maximum number of lamps burning simultaneously. Thus, 100 lamps burning for 20 hours would contribute five times as much to the demand cost as 20 lamps burning for 100 hours, but they would contribute the same amount to the energy cost. On the other hand, 100 lamps burning for 80 hours would cause the same demand cost as 100 lamps burning for 20 hours only, but they would cause four times the energy cost.

[4] The object of this appendix is not to give a scientific explanation of the terms "kilowatt" and "kilowatt-hour," which are so frequently encountered in central-station and rate practice and which are not always fully understood, but to give the commercial man a clear working insight of what is meant by these terms. It deals, therefore, rather with examples than with definitions, and scientific exactness of expression is sacrificed for brevity and clearness.

for instance, a second—this means a certain "power." And now we see that if a certain power is applied for a certain length of time the result must be again mechanical work.

The work done by one horsepower every second is called a horsepower-second and that done by a kilowatt every second is called a kilowatt-second. According to the preceding paragraph a horsepower-second and a kilowatt-second are units of mechanical work just as the foot-pound. Indeed the horsepower-second equals 550 ft.-lb., as is easy to understand, and the kilowatt-second equals 738 ft.-lb.

Similarly, the work done by one kilowatt during one whole hour is called a *kilowatt-hour.* A kilowatt-hour is evidently 3600 times as big as a kilowatt-second, because an hour contains 3600 seconds. A kilowatt-hour has, therefore, $3600 \times 738 = 2{,}656{,}800$ ft.-lb. In exactly the same manner we can talk about a horsepower-hour, which is $3600 \times 550 = 1{,}980{,}000$ ft.-lb.

It is also clear that we can obtain one kilowatt-hour either by using one kilowatt for one hour, or two kilowatts for one-half hour, or 60 kw. for one minute, or 1/10 kw. for 10 hours, etc.

Electrical work is generally not called "work" but "energy."

It is important for the student of electric rates to get the difference between kilowatt and kilowatt-hour quite clearly fixed in his mind. The following may prove helpful. A salary of $100 per month is not the same as a capital of $100. The relation between the two is the same as between the kilowatt and the kilowatt-hour. A salary is *the rate* at which a man gets his money. It is money *per month,* measured in dollars *per month,* just as the kilowatt is *the rate* at which work is being done (energy being supplied), measured in foot-pounds *per second.* If we multiply salary by months we get a certain amount of money, which may be capital, and if we multiply kilowatts by hours we get work or energy, kilowatt-hours. Thus $500 per month during two months results in the same amount of money as $100 per month during ten months, namely $1000. Just so 5 kw. for two hours result in the same work as 1 kw. applied during 10 hours, namely 10 kw-hr. or 26,568,000 ft.-lb.

Power (kw.) corresponds to.....Salary (earning power), $ per month.

Work or energy (kw-hr.) corresponds to.....Capital (accumulated salary), $.

Just as the power is the rate at which work is being done or consumed, so velocity or speed might be defined as the rate at which a distance is increased or decreased. The speed of a ship, for instance, is the rate at which the ship is moving away from a certain point (or towards it) and it is measured in (nautical) miles per hour, just as the power is measured in foot-pounds per second. The velocity of one mile per hour is called "one knot." Now the term "one knot" does *not* mean "one mile." The expression sometimes heard, "a speed of twenty knots per hour," is nonsensical. The knot is a certain speed, a rate of progress in miles per hour and a mile is a certain length, a certain total progress, so to speak, irrespectively of time. Instead of "one mile" we could also say "one knot-hour," although the term is not customary. Just so the kilowatt or watt or horsepower is a certain power, or rate at which work is being done or consumed, corresponding to the knot, and the kilowatt-hour or watt-hour or horsepower-hour, corresponding to the "knot-hour," is a certain work *irrespective of time,*[5] and can be measured, for instance, in foot-pounds.

Kilowatt, watt or horsepower means the rate at which an engine or some other device is generating or consuming work. An engine is running at 1000 hp. at a certain moment, a ship is using 5000 hp. for its propulsion at a certain speed, an electric generator is putting out 2000 kw., an electric furnace is consuming 5000 kw. at a given moment. Frequently, however, the terms kw., etc., are used to denote the maximum or the normal output which a generating device (engine) is capable of supplying or a consuming device (lamp, motor) is capable of consuming, just as the term "speed of a steamship" may mean either the speed at which the ship happens to be running at the moment to which one is referring, or the term may mean the maximum or the normal speed of the ship. So the terms kilowatt, horsepower, watt, etc., may also be used to denote the size of an engine or other device. We talk of a 10,000-kw. generator and of a 250-watt incandescent lamp. We talk of a 200-hp. boiler, meaning a boiler which, if normally operated, gives just enough steam to produce 200 hp. in the engine which is run from the boiler.

To summarize: Kilowatt-hour means *work* or *energy;* kilowatt means the *rate* at which work is being done and in a secondary meaning the term kilowatt denotes the capacity of machinery, etc. We can get the same number of kilowatt-hours with a *large* number of kilowatts operating for a *short* time or with a *small* number of kilowatts operating for a *long* time.

*(To be continued.)*

[5] Although the term "hour" occurs in the denomination.

## THE FUTURE OF ELECTRICITY SUPPLY IN ENGLAND.

The Incorporated Municipal Electrical Association, whose summer conventions have been conducted under the clouds of war and therefore in a very restricted manner for the last few years, resumed the normal character of its proceedings at the three-day meeting held at Ipswich and Felixtowe on the East Coast of England from June 18 to 20. The subjects before the convention were: "The Application of Whitley Committee Recommendations to the Electric Supply Industry" (Alderman W. Walker); "Electric Transmission" (discussion opened by S. L. Pearce, city electrical engineer of Manchester); "The Assessment and Rating of Electric Supply Undertakings" (Bailie W. Smith).

The president for the year is F. Ayton, city electrical engineer of Ipswich, and chairman of the English Electric Vehicle Committee. In his inaugural address at the meeting, Mr. Ayton said that in achieving victory in the war, electric supply engineers and their undertakings had played no small or unimportant part. Public electric supply had been fundamental to the production of munitions of war in huge quantities. Now they were on the eve of momentous changes in the organization of the electric supply industry. Whatever might have been the effects of the war in other directions, posterity would concede that, as concerned the electrical industry, the war did good by bringing the British nation to recognize first, the importance of electric supply, and secondly, the general inefficiency and the drawbacks of the present methods of electrical generation and distribution, and to take active steps towards improvement.

The difficult conditions of war time were followed by the easing off in output that came from the signing of the armistice, which afforded, in some ways, a rather welcome relief. That event, however, brought upon them at least one new difficulty of a serious character in the considerable falling off in the industrial demand and the consequent decline in revenue. "This," said Mr. Ayton, "is, of course, but a temporary condition which will right itself so soon as our industries can be re-established upon a normal peace footing, labor difficulties be composed, and the galling restrictions on export trade removed. Nevertheless, the reduction in revenue which has resulted, and which it was, of course, impossible to foresee when our estimates for the year were framed, has placed a number of undertakings, whose output was largely for industrial power, in a somewhat serious financial position. The incidence of the fuel and lighting order has also been responsible for a not inconsiderable reduction in revenue from private residence and other consumers coming within the purview of its restrictions."

In regard to the Government Electricity Supply Bill now before Parliament, President Ayton said that the association had advanced certain criticisms and recommendations and if the bill was altered as it desired in matters of detail, the important principle of public control being adhered to and safeguarded, there was little doubt that the carrying out of its provisions would be of immense benefit to the nation, and in particular to the electric supply industry.

# Problems of Power Transmission at 220 Kilovolts

## Field for 220 Kilovolts—Design Features of Line and Apparatus — Excerpts from Paper by A. E. Silver Before A. I. E. E.

THE dependence of industrial progress upon an adequate supply of electrical power, together with the vital need for a rational policy of conservation of the country's fuel resources, points to a probable early demand for transmission of large blocks of power from distant energy sources—coal fields and water powers. Two hundred and twenty kv. is suggested as a logical voltage for such high-capacity, long-distance transmission.

THE FIELD FOR 220-KV. POWER TRANSMISSION.

Visualization of the demands of this evolution points to the need of trunk electric transmission service of a capacity and range of greater magnitude than thus far developed or required. Increasing distances and increasing quantities of power require an increasing voltage for economic transmission. The quantities and distances involved in the broad field outlined in the preceding paragraph pass beyond the economic range of existing transmission voltages. The practical working out of this next step in the transmission art is a problem now definitely facing the engineer and manufacturer.

Two hundred and twenty kv. appears a logical choice for the next step in the transmission voltage schedule, because, from an appraisal of the general situation, a voltage of this order is considered adequate for the immediately pending needs of the industry and commensurate with expected growth in transmission service demands for a considerable period. Its suitability to a variety of conditions and the probable extent of its use would assure it a place in the schedule of transmission voltages which commercial needs are rapidly standardizing. Furthermore, such a voltage, while representing a step beyond present usage sufficient to afford a distinct economic advantage, does not reach so far into uninvestigated fields but that the problems of development and design can be approached with full confidence of early commercial solution.

The particular numerical value of 220,000 is in accord with the well established practice of standardization in multiples of 11,000. In some instances, it may be an incidental convenience that this voltage is the double of the extensively used 110 kv.

An illustration of the advantage for long transmission distances of 220 kv. over the highest present system voltage, 150 kv., is given in Figs. 1 and 2. This comparison is based upon a transmitted load of 500,000 kw. The same relative advantages will obtain for larger loads, and, above a certain minimum, for smaller loads.

The field of 220 kv. is not broad. Its economic application is primarily to large blocks of power and long transmission distances. It is in no sense a panacea for transmission problems generally. It presumably will infringe to some extent upon the present fields of the lower transmission voltages, but will by no means tend to supersede their use, in fact it will considerably enlarge the field of usefulness of such secondary transmission voltages as 66 kv. and 110 kv. It is not a universally suitable medium for extensive interconnection of power systems.

Power from steam-electric stations in the coal fields or from large hydroelectric stations would advantageously be transmitted over 220-kv. lines to terminal substations at important load centers or at the hubs of secondary transmission networks serving industrial areas. The introduction of transmitted power, in amounts limited only by the load demands, will constitute a strong stimulus to expansion of these networks. Power equalization between load centers might frequently best be accomplished through extension of these secondary transmission lines. Interconnection at 220 kv. would be expected only where the equalizing duty reaches a large magnitude, where there is no existing secondary transmission system suitable to serve as a basis for inter-connecting lines, or where interconnecting 220-kv. lines might function also as a supplementary or important reserve link in a main 220-kv. trunk transmission system.

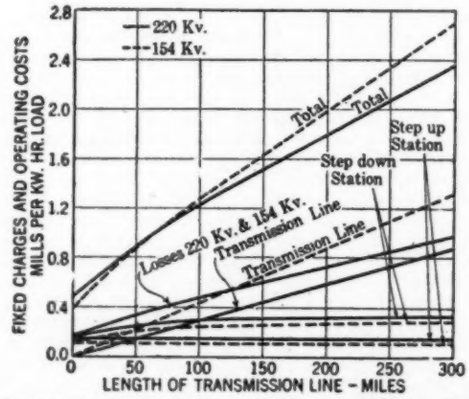



Fig. 1—Economic Comparison of 154-kv. and 220-kv. Transmission—Fixed Charges and Operating Costs—Seven Lines 154 kv. and Four Lines 220 kv.—500,000 kw. Delivered.

Costs and losses include those of lines, step-up and step-down, substations and synchronous condensers.
Costs of line per mile, 154 kv. $20,000, 220 kv $23,500—all costs based on early 1919 prices.
Size of conductor 92,900 cm. steel—716,000 cm. aluminum.
Losses based on 0.95 load factor and 0.85 power factor delivered load.
Cost of energy 5 mils per kilowatt-hour.
Fixed charges and operating expenses of transmission lines 13 per cent, substation 15 per cent.
Voltages high side of transformers, receiver end 150 kv. and 200 kv., sending end 170 kv. and 225 kv.

The initial investment in a 220-kv. system, including as essential elements the step-up and step-down stations, will be of such magnitude that there will be a strong inducement to utilize the investment as nearly continuously as practicable, thus reducing the unit transmission cost of energy supplied. The relegation of existing stations to partial operation or reserve service will be gradual, and, even when transmitted power becomes the main reliance, presumably it will usually prove more economical to maintain local sta-

tions for reserve and short peak load service than to provide necessarily expensive transmission capacity for such short periods of actual use.

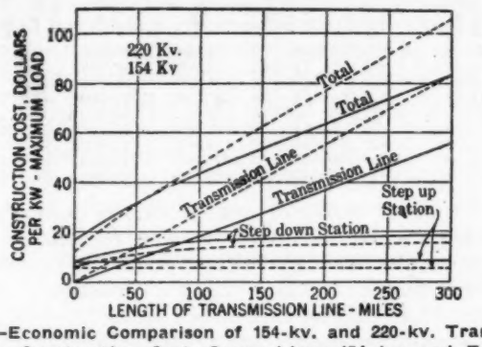



**Fig. 2—Economic Comparison of 154-kv. and 220-kv. Transmission—Construction Cost—Seven Lines 154 kv. and Four Lines 220 kv.—300,000 kw. Delivered.**

Costs include those of lines, step-up and step-down substations and synchronous condensers.
Costs of line per mile 154 kv. $20,000, 220 kv. $23,500—all costs based on early 1919 prices.
Size of conductor 92,900 cm. steel—716,000 cm. aluminum.
Voltages high side of transformers, receiver end 150 kv. and 200 kv., sending end 170 kv. and 225 kv.

It is assumed that even an initial 220-kv. system would be laid out on a basis of two or more main generating stations connected to load centers by a number of circuits. The load per 220-kv. circuit has been assumed to be from 100,000 kw. to 125,000 kw. A lower load per circuit than 100,000 kw. would entail a considerable sacrifice of the economy obtainable through use of 220 kv. No discussion is offered as to the maximum economic load per 220 kv. circuit since in any initial system the number of circuits would be determined from considerations rather of reliability insurance or load distribution than of maximum inherent economy. Where the studies involve a specific transmission distance, 250 miles has been assumed for purposes of illustration. The frequency of a 220-kv. trunk transmission system should be 60 cycles. Transformer connections, at all installations, should be grounded Y for the 220-kv. windings.

Corona formation and corona loss enter as a significant factor in the design of transmission lines at 220 kv.

Apparently the choice of conductor materials and types for 220 kv. service is limited, at least from the standpoint of immediate availability, to three alternatives, (1) aluminum with steel core; (2) copper with steel core; (3) all copper.

For equal conductivity, the relative physical advantages of the three types of conductors may be summarized as follows:

*Aluminum-steel vs. copper-steel*

1. Less corona loss, due to larger diameter
2. Skin effect presumably approximately equal
3. Greater area exposed to wind loading, hence, greater transverse tower strength and greater clearances required
4. Less tensile strength, hence more limitation upon height and spacing of towers
5. Less weight (unimportant)

*All-copper vs. composite cable*

1. More corona, greater than either of above
2. All material effective as a conductor
3. Skin effect more serious in larger sizes, owing to high priced material in the core
4. Less area exposed to wind loading
5. Less total tensile strength than either of above
6. Less weight than copper steel
7. Homogeneity of material, hence certain advantages in construction, more positive assurance of durability and higher scrap value

For the purpose of developing tower designs, a cable of 716,000 c.m. of aluminum and 93,000 c.m. of steel has been used in the studies.

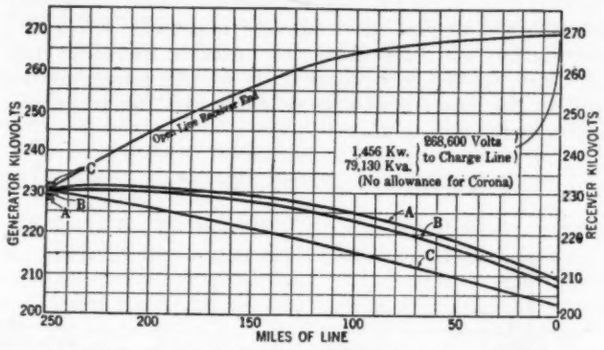



**Fig. 3—220-kv. Transmission Line Characteristics—Relation Between kw., kv., p f. and Condenser kv-a.—Conductor—450,000 cm. Copper—308,200 Steel.**

CALCULATION ASSUMPTIONS.

Steel core copper conductor—450,000 cm. copper and 308,200 cm. steel—20 ft. horizontal spacing.
Constant receiver volts—200,000 (low side receiver transformer—includes transformer drop).
Constant generated volts—230,000 (high side generating transformer).
Loads—delivered at 75 per cent power factor.
Transformer bank of 50,000 kw. capacity with—resistance 0.5 per cent—reactance 12.0 per cent.
Two banks of transformers in parallel at each end of line.
Losses include those of line, transformers and synchronous condenser.

RESULTS.

| Curve | Rec'r kw. | Cond'r kv-a. | High voltage Receiver kv. | Receiver % p. f. 250 mile line | Generator kv. | Generator %. p f. | Equiv. low voltage gen. kv. | Equiv. low voltage gen. % p. f. | Losses (excl. corona loss) kw. | Losses (excl. corona loss) % |
|---|---|---|---|---|---|---|---|---|---|---|
| A | 0 | *49,000 | 209.0 | * 0.18 | 230 | † 5.48 | 227.9 | † 5.56 | 2,704 | .... |
| B | 50,000 | † 7,600 | 207.2 | *78.24 | 230 | †96.89 | 228.6 | †97.70 | 2,691 | 5.4 |
| C | 100,000 | †81,600 | 202.9 | *98.80 | 230 | *99.97 | 231.7 | *99.51 | 11,843 | 11.8 |

Note: *Indicates lagging quantities. †Indicates leading quantities.

The operating characteristics of a 220-kv., 250-mile line are illustrated by Fig. 3, which shows a copper-steel and an all-copper conductor the relations between power transmitted, generator, receiver and line voltages, power factor, condenser load and resistance losses.

A study of the relative economy of various sizes and types of conductors is shown in Fig. 4, with explanatory data in the accompanying table. This study shows, for a load of 100,000 kw. per circuit delivered at 0.75 power-factor and at load-factors of 60%, 75% and 90%, that the combined annual costs of such items of the transmission system as would be materially affected by the size and type of the conductor, *i. e.*, interest, taxes and amortization charges on cost of conductor, annual value of lost power on the line due to resistance and corona and of power absorbed by transformers and condensers. The curve falling lowest on the scale, at any number of years which may be assumed as the life of the line, represents the most economical of the conductors considered.

This curve is presented merely as an example of

the general method followed in studying conductor economy. It does not represent the degree of refinement which would be warranted in making final determination of the economical conductor for an actual 220-kv. installation. Other items for which allowance should be made in such a study are the effect of conductor size and type upon cost of line structures and insulators, and the possible scrap value of the conductor. Amortization should preferably be calculated by the annuity or "sinking fund" method rather than by the simpler straight line method. Obviously, in any case great refinement in the technical assumptions is not called for until reasonably close values can be assigned to cost of conductor materials, for which the market will presumably be unstable for some time to come, to the equivalent costs of the power losses, and to the percentages to be employed for return on investment, taxes, etc.

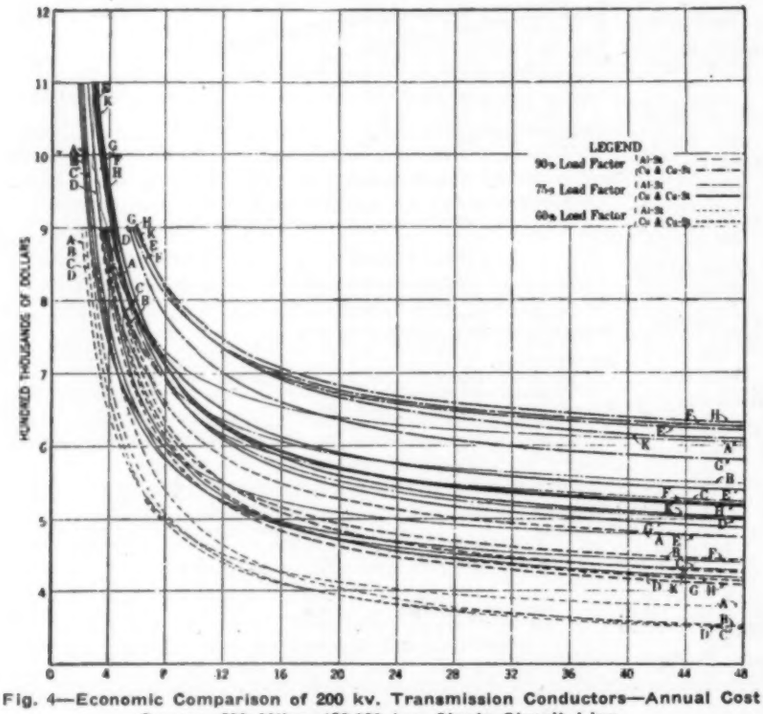



Fig. 4—Economic Comparison of 200 kv. Transmission Conductors—Annual Cost Curves—250 Miles, 100,000 kw. Single Circuit Line.
(See table for explanatory data.)

DATA RELATING TO ECONOMIC COMPARISON OF 220-KV. TRANSMISSION CONDUCTORS.

(See Fig. 4.)

ANNUAL COST CURVES FOR 9 DIFFERENT CABLES AT 3 LOAD FACTORS.

1. Annual cost curves are plotted, dollars as ordinates, years as abscissas, and show the annual cost for any period up to 48 years. This is explained as follows:

   Annual Cost Includes
   1. Depreciation expressed as first cost divided by number of years chosen.
   2. Yearly interest and taxes taken as 8% of first cost.
   3. Annual value of lost power taken as 5 mills per kw-hr.

   First cost includes only cost of finished aluminum-steel cable at 44.9 ct. per lb. for aluminum and 12.2 ct. per lb., for steel f. o. b. factory. First cost of finished copper or copper-steel cable @ 27.7 ct. per lb. for copper and 12.2 ct. per lb. for steel f. o. b. factory. All other items of construction costs have been eliminated as not materially affecting the relative positions of the curves.
   Lost power includes line $I^2R$, transformer $I^2R$, condenser loss and Corona loss.
2. Cable Data.

| Curve designation. | Kind of cable. | First cost. | Alum. or copper. | Steel. | Total of cable. | Alum. or copper. | Steel. | Diam. of cable. |
|---|---|---|---|---|---|---|---|---|
| A | Al.-St. | $1,175,700 | 605,000 | 78,000 | 683,500 | 54 | 7 | 0.952 |
| B | Al.-St. | 1,362,800 | 716,000 | 92,900 | 808,900 | 54 | 7 | 1.036 |
| C | Al.-St. | 1,513,500 | 795,000 | 103,100 | 898,100 | 54 | 7 | 1.092 |
| D | Al.-St. | 1,814,000 | 954,000 | 123,700 | 1,077,700 | 54 | 7 | 1.196 |
| E | Copper | 1,764,800 | 500,000 | ..... | 500,000 | 37 | .. | 0.814 |
| F | Cu.-St. | 1,733,300 | 450,000 | 105,000 | 555,000 | 30 | 7 | 0.857 |
| G | Cu.-St. | 1,924,400 | 500,000 | 116,600 | 616,600 | 30 | 7 | 0.904 |
| H | Cu.-St. | 1,790,200 | 400,000 | 274,000 | 674,000 | 54 | 37 | 0.946 |
| K | Cu.-St. | 2,011,700 | 450,000 | 308,200 | 758,200 | 54 | 37 | 1.004 |

No type of insulator yet developed demonstrated its ability to give adequate, or even reasonably satisfactory results on high-voltage lines. It is believed, however, that practicable 220-kv. insulators can be obtained from present established types.

It should be noted that a string of 15 standard units, with the necessary connecting pieces and fittings, will be nearly 9 ft. long. Such a length of insulator obviously involves great expense in obtaining the necessary tower clearances and heights and it is also the determining feature in fixing conductor separation. This serves again to call attention to the need of more efficient and suitable insulators. An improvement in insulator design which would justify shortening the string, in addition to improving the electrical characteristics of the insulator itself, would enable material saving in tower costs. A wholly new insulator, having no greater length than necessary to insure requisite air clearances from conductor to support, say 4 or 5 ft., would enable a correspondingly greater and a very significant saving in tower costs. Such an insulator at moderate price might readily open the door to a variety of new types and arrangements of supporting structures.

Two methods are recognized as offering relief from this excessive concentration. The first is the grading of the insulator units used in the string. This would be accomplished by making up the string of units of two or more distinct types, differing in size or diameter or in some other feature which would cause them to have different condenser capacities, those with the larger capacities being placed nearest to the conductor. A second method of relieving this excessive concentration of stress consists in installing below or around the disk nearest the conductor suitably designed metallic shields or rings. The effect of such shields in improving the stress gradient may be even more marked than that of grading the insulator units.

In general either grading or shielding or a combination of the two appears to be feasible. Neither would appear to require any very elaborate investigations and tests to determine effective designs free from possibility of secondary complications of any moment. The conditions with the 15-unit string of standard units are so unsatisfactory that probably some alleviating measures should be adopted. Of the two described, probably grading could be developed to a point ready for actual use most quickly and with least experimental investigation. It is wholly possible that a considerable grading effect might be worked out

through selection from present commercial types of disks.

A feature of the insulator situation which complicates the question of voltage stress distribution and which will have some effect upon methods of carrying out remedial measures is the fact that in order to obtain adequate mechanical strength, as will be discussed later, two or three strings of standard disks must be used in parallel at suspension points, and proportionately more at tension points.

The belief is widely entertained that arcing horns or rings or other discharge devices are of sufficient benefit to warrant their use. They would fulfill several functions, the first and primary function being to protect the insulator from the destructive heat of an arc. Other functions are protection of the conductor from the possible burning by a high-power arc, and reduction of the likelihood of insulator puncture. The suggestion has been offered that, with a line operating near the corona limit, high-voltage surges at high frequency, representing usually small amounts of energy, tend to dissipate themselves in corona, corona dissipation of energy being more rapid at high frequencies. In any event it is believed improbable that a line sufficiently well insulated to withstand low-frequency high-power disturbances is likely to encounter trouble from high-frequency disturbances.

The long economic life which presumably a 220-kv. line would represent causes durability of material to assume even greater importance than in present practice, so that for most localities wood construction would not be economical, even assuming that the requisite strength for the heavy loads could be secured without resorting to unduly short spans. Therefore, the conventional rigid steel tower has been adopted as the most available for construction in the immediate future, and a series of standard towers of different strengths, adapted to safe and economical use under varying conditions of span lengths and angles, are considered according to the growing practice in heavy line construction.

### Features of Station and Equipment.

For 220-kv. transmission and generation certain salient features become important. For instance, design for such large capacities and high voltage centers around one cardinal principle, simplicity and intrinsic strength of equipment, rather than flexibility and external protective measures. The number of buses should be reduced even to a rudimentary form, superfluous oil switches should be eliminated, and spare or reserve units need not be provided. Of course, the complete omission of reserve equipment is predicated on adequate reserve capacity being available in local generating stations and on the high standard of construction formerly emphasized.

Considerations of simplicity in station arrangement and of economy in operation favor, in general, transformers of the largest size permitted by the conditions of each installation or by limitation of manufacture. At the present stage of the art the manufacturers advocate that transformers be not attempted beyond 50,000 kv-a. to 60,000 kv-a. for three-phase units, or beyond 35,000 kv-a. to 40,000 kv-a. for single-phase units. As to choice between three-phase and single-phase units, from the standpoint of simplicity and cheapness of installation, three-phase units would be preferable. At generating stations operating and economic considerations strongly favor making generator and transformer equipment an integral unit.

The large sizes of installations involved in a 220-kv. system, together with the necessity for careful attention to maintaining insulation strength and transformer reliability generally, will not improbably result in the abandonment of cooling the oil in each transformer and gravity circulation of oil through the windings in favor of forced oil circulation and external cooling. Short-circuit current values at 220 kv. are not extreme, and in a 220-kv. circuit-breaker the large clearances and switch openings necessarily required by the high voltage contribute directly to giving the rupturing capacity required by the current to be handled. Two types of circuit-breakers have been offered by manufacturers for 220-kv. high-duty service. One type consists of a massive circuit-breaker, each phase in one tank of heavy boiler plate, with two breaks in series for moderate duty and four breaks in series for heavy duty. The other type consists of two breaks in series per tank, one such tank being used for conditions of moderate duty and two tanks in series for heavy duty.

Substation layout rated at 220 kv. will be influenced largely by the particular local conditions of each installation. The usual type will probably serve to step down from 220 kv. to a secondary transmission voltage, such as 66 kv. or 110 kv. In such cases it will generally be necessary to have a primary and a secondary bus system—at 220 kv. a simple bus with sectionalizing circuit-breakers; at secondary voltage, where greater flexibility would seem desirable, probably a ring bus. Owing to the high-current values which would obtain at the secondary voltage, it appears advisable to provide sectionalizing reactors in this bus. It should be kept in mind that the large condenser capacity will aggravate short-circuit conditions.

The station and substation arrangements which have been proposed are predicated upon a relay system which may be depended upon for insuring that a faulty piece of apparatus, transmission line or low-voltage feeder will be cut out correctly, promptly and in such a manner as to avoid interruption to the other elements of the system.

### Construction Cost.

The following estimates, based upon 1919 prices, capacities of 200,000 kw. and above and 220 kv., are intended to give an indication of the installation cost of construction carried out along the lines of the assumptions and recommendations in this paper:

#### Step-Up Substation.

| | |
|---|---|
| Outdoor transforming and switching structures and equipment (220-kv. apparatus and connections only), installations and indirect expense, per kw.. | $8 to $9 |

#### Step-Down Substation.

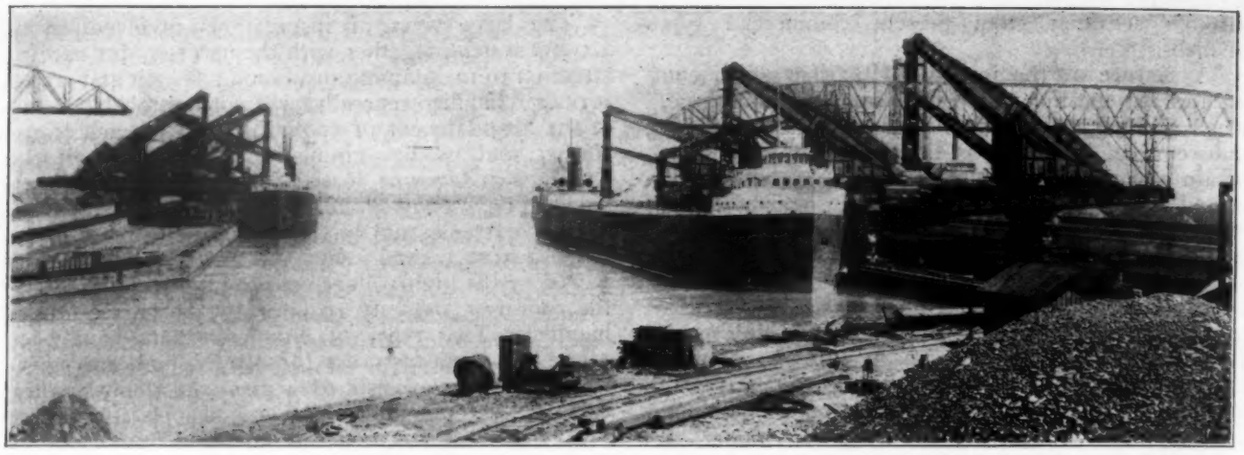
| | |
|---|---|
| Outdoor transforming and switching structures and equipment (does not include low-tension feeder bus or feeder switching equipment), synchronous condensers of capacity for length of connected lines, building, control equipment, installation and indirect expense, per kw | $15 to $20 |

#### Transmission Lines.

| | | |
|---|---|---|
| Single circuit-steel towers-suspension insulators: | | |
| Towers, per mile | $8000 | |
| Insulators and hardware, per mile | 2800 | |
| Conductors and ground wire, per mile | 5000 | |
| Special structures, per mile | 1000 | |
| Right-of-way, per mile | 3000 | |
| Indirect expense, per mile | 3700 | |
| Total, per mile | — | $23,500 |

#### Total Cost 220-Kv. Transmission.

| | |
|---|---|
| 100 miles, per kw | $40 to $45 |
| 200 miles, per kw | 60 to 65 |
| 300 miles, per kw | 80 to 85 |



Eight Electrically Operated Ore Unloaders at Ashtabula, Ohio—These Docks Have an Unloading Capacity of 76,000 Tons of Ore Per 24 Hours, Equal to Cargoes of Six of the Largest Ore-Carrying Vessels.

# Unloading Ore Quickly and Cheaply

## How Iron Ore Is Unloaded from Lake Steamers by Means of Electrically Operated Automatic Ore Unloaders—Description of Modern Unloading Machine

MOST of the iron ore used as the basis of our immense iron and steel industry is obtained from the rich ore deposits near the southern and southwestern shores of Lake Superior. Iron ore is very heavy and the distance from these mines to the blast-furnace plants ranges from several hundred to over a thousand miles, consequently transportation by rail would be very expensive. Therefore, practically all of the ore is shipped by water, the Great Lakes affording a very convenient waterway for this purpose. Large, special ore steamers are used for this service. Since navigation is limited to about seven months per year on account of ice in the northern lakes, this means shipping all the ore intensively during the open season and every facility is utilized to load the vessels quickly, sail them as quickly as possible without stop to the unloading point, unload them quickly and return them for another trip.

Through the development of efficient and powerful loading and unloading machines, the cost of handling the ore and the time that the vesse's are tied up at the Lake Superior loading docks and the various unloading ports have been very greatly cut down. The loading and unloading machines are electrically operated for the most part and therefore are of much interest to electrical men. Probably the highest development achieved in this line of machinery is in the unloader illustrated and described herewith. It is the product of the Wellman-Seaver-Morgan Co., Cleveland, Ohio. Over 50 of these machines are in use on the Great Lakes unloading ore steamers.

The automatic unloader shown in the accompanying illustrations is unique in design and has proved through many years of service to be one of the most successful devices for unloading ore cargoes from lake steamers that has ever been devised. Although of immense proportions, the design has been simplified and the control perfected to such a point that the machine is a marvel in delicacy of control and operation.

### Description of the Unloader.

The unloader consists of a main framework mounted on wheels which travel along the runway rails which are located approximately as shown in the views herewith. The main framework extends back to the rear runway over a temporary storage pile where the ore can be discharged, if desired. Between the front and rear runways, space is provided for railroad tracks where ore-carrying cars are placed under the machines and loaded with ore for transportation to the furnace plants. The girders of the main framework form a support for runway rails on which a trolley travels. This trolley supports a balanced walking beam, from the outer end of which a stiff bucket leg depends. At the lower end of this leg is the bucket, which is operated by machinery located on the walking beam. All horizontal movements of the bucket are accomplished by means of moving the trolley backward and forward on the girders. The vertical movements of the bucket are accomplished by the operation of the walking beam. The forward portion of the beam being out of balance, the bucket descends by gravity as soon as the brakes of the hoisting mechanism are released.

The hoisting mechanism controlling this operation is located in the enclosed house at the rear end of the walking beam. Ropes from the winding drums of this mechanism pass around sheaves located in the rear end of the trolley and are anchored to the rear end of the walking beam.

In addition to the main parts of the machine which have been described, there is also a receiving hopper located at the forward end of the main framework and between the main girders; this is provided for the purpose of receiving the ore discharged from the bucket. The capacity of this hopper is about three full bucket loads and its purpose is to act as a balancing point for the ore between the bucket and the cars or storage as the case may be. The bottom of the hopper is provided with outlet gates and the con-

tents are discharged as required into a larry which runs on an auxiliary track suspended from the under side of the main girders.

The larry, after receiving its load from the main hopper, moves to a point so that its contents can be discharged either into the cars standing on the railroad tracks beneath the main span of the girder or into a temporary storage pile under the cantilever at the rear of the machine. The ore so placed in this temporary stock pile cannot be reclaimed by means of these machines, as their function is solely one of unloading the cargo from the ships.

Machines of this type have been made in two sizes, the smaller size having a capacity of 10 tons and the larger size (such as is shown in the illustrations) having a capacity of 17 tons in the bucket shells. The machines shown here are electrically operated throughout and their speeds are regulated so as to operate through a complete cycle in about 50 seconds.

Some idea of the capacities of unloading by this method may be derived from a record which was made in Ashtabula, Ohio, by eight machines of this type having a capacity of 15 tons each, unloading seven boats having a total capacity of 70,000 tons in 22 hours actual time.

At other points, four machines working in boats having capacities up to 13,000 tons have unloaded these cargoes in about 3 hours and 25 minutes.

### Method of Operating.

The operation of the machine is as follows:

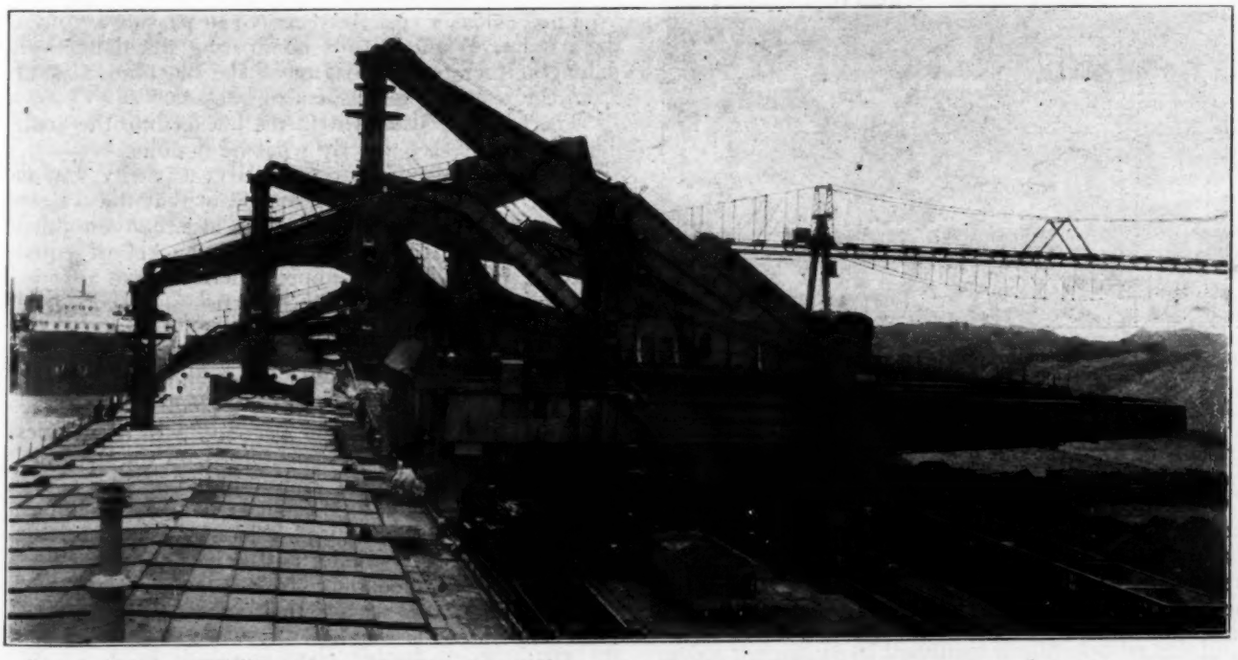
After the boat has been placed alongside of the dock, the machine is moved opposite one of the hatches and the bucket is lowered through the hatch into the ore. After filling the bucket, the walking beam hoist mechanism is put in operation and the bucket hoisted out of the boat. At the same time, the trolley is traveled back so that the bucket is brought over the main hopper between the girders and the main framework and its contents are discharged into this hopper. The bucket is then immediately returned to the boat for another load. The ore in the main hopper is discharged into the larry which has been brought to a point directly underneath the discharge gates of the hopper. The larry hopper is filled and the larry is moved over the desired discharge point and the gates of the larry hopper are opened discharging the ore as required. The larry hopper is provided with scales so that the contents are accurately weighed and recorded. In this way a car can be loaded to its allowable capacity and an accurate record kept of the amount of ore so discharged into the car, thus eliminating the necessity for the use of track scales and reweighing.

If railroad cars are not available for immediate shipment, the larry is traveled to a position on the rear of cantilever and its contents discharged into a temporary storage pile, from which it is usually reclaimed for shipment or storage by means of a bridge, located on the runway at the rear of the unloader.

Only two operators are required for the entire operation of one of these machines. One of the operators, whose station is in the bucket leg directly over the bucket shells, controls all of the motions of raising and lowering the bucket, of traveling the trolley back and forth, and moving the machine along the dock from one hatch to another. The second operator is stationed in a cab on the larry and from this station he controls the movement of the larry, the operation of the larry gates, and the weighing of the ore.

The bucket shells are each made of a single piece of plate formed to the shape as shown in one of the views. These bucket shells are usually provided with manganese-steel cutting lips which are essential to resist the abrasive action of the ore. The bucket shells themselves are carried on heavy cast-steel arms mounted on rollers traveling in guides in the fixed portion of the lower end of the bucket leg. The position of the operator who controls the operation of the bucket, etc., as previously described, is also shown in this view. It shows the bucket in operation in the hold of a modern ore carrier after most of the ore has been removed and the balance of the ore has been scraped into position so as to be handled by the bucket.

The motor for operating and closing of the bucket is located in the machinery house at the back of the

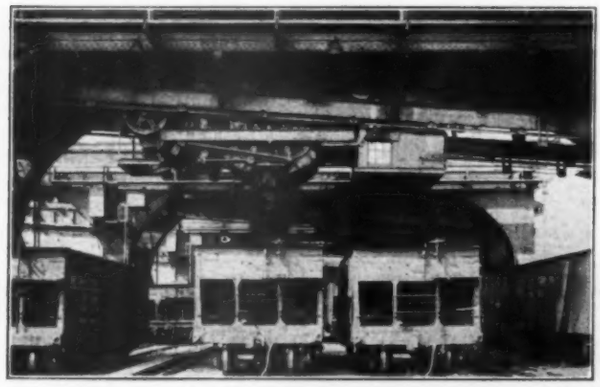


**Part of the Seven Ore Unloaders at the United States Steel Corporation's Docks at Conneaut, Ohio.**

walking beam. Ropes from this bucket-closing mechanism are carried through the walking beam and the bucket leg and attached to a power drum in the bucket leg directly over the operator. This power drum is geared to the closing chain drums, one of which is shown on this photograph. The bucket is closed by rotating the drums in the proper direction. The bucket is opened by reversing the motor and the bucket shells are forced open by means of an opening chain located in the center of the bucket leg between the two closing chains.

In addition to the vertical movement, which is given to the bucket leg by means of the walking beam, it also has a motion of rotation around its vertical axis. This is accomplished by means of ropes attached to a segment on the bucket leg itself, the ropes being carried back in the walking beam to a rotating mechanism which is located adjacent to the bucket-closing mechanism. The bucket leg itself is carried on a roller bearing which is attached to the top end of the leg. This motion is introduced for the purpose of turning the bucket at right angles to the hatchway in order to secure as great a reach lengthwise of the boat as possible, thus the bucket is enabled to reach out under the hatches and remove ore which is not directly beneath the hatch opening. The distance from point to point of the bucket shells when open is approximately 21 ft.

The scale larry, into which the main hopper discharges, has a capacity of between 35 and 45 tons and two larry loads are intended to constitute a full carload of ore. The arrangement of the discharge gates of the larry is clearly shown in one view. They are suspended from the sides of the larry frame and operated by connecting rods which attach to cranks, also connected to the main larry frame, these gates being operated by means of a small motor which is carried at the rear of the larry. The gates are so arranged that all or a portion of the contents of the larry may be discharged. The hopper of the larry is suspended in the larry frame on scales so that the contents of the larry may be wholly or partially discharged and be accurately recorded.



**Scale Larry Into Which the Main Hopper Discharges the Ore—This Larry Weighs the Ore and Discharges It Into Cars or Into Storage.**

The mechanism for moving the larry back and forth on its track is also located on the larry and consists of winding drums upon which ropes are wound, the end of the rope being attached to the rear end of the cantilever on the main framework. The larry track is inclined by means of these ropes and descends by gravity.

### Electric Motors and Control.

As previously stated, these machines are usually electrically operated throughout. In some cases, however, machines of the same general type have been made to operate by steam and hydraulic cylinders, water being supplied to the operating cylinders by means of a steam accumulator which furnishes water at a pressure of 1000 lb. per sq. in. The electrically operated machines are usually designed for a 220-volt direct current. Alternating current is never used. The motors required for the equipment of one of these machines are as follows:

| | | |
|---|---|---|
| Beam hoist | 1 motor, | 275 hp. |
| Bucket closing | 1 motor, | 120 hp. |
| Bucket rotating | 1 motor, | 25 hp. |
| Trolley travel | 1 motor, | 120 hp. |
| Hopper gates | 1 motor, | 100 hp. |
| Longitudinal travel | 1 motor, | 100 hp. |
| Larry travel | 1 motor, | 150 hp. |
| Larry gates | 1 motor, | 40 hp. |

The control equipment for these motors is of the magnetic switch type throughout, having master controllers in the operators' cabs in the bucket leg and on the larry.

Electric current is supplied to these machines by means of insulated conductor rails running the length of the main runways. The current is collected from these rails by means of pickup shoes and distributed to the various portions of the machine. A similar collecting device is also employed for supplying the main current to the trolley. Conductor rails are attached to the main framework of the machine and the current collected from these rails by means of pickup shoes attached to the trolley.

### Economies and Other Advantages.

Many points of superiority claimed for the Wellman-Seaver-Morgan ore unloader, which are not found in other systems of unloading are:

The design is very heavy; there is little to get out of order, resulting in low maintenance cost per ton of material handled.

Control is accurate and positive, and manual labor is reduced to a minimum.

The bucket is positively guided in passing through the hatches of ships, thus eliminating the danger of damage either to the boat or to the machine, arising from the use of rope-suspended buckets.

The operator travels with the bucket into the boat, and can always see exactly what he is doing.

The bucket is of extremely large capacity, but is so suspended from the walking beam that the weight resting on the tank top of a boat is less than one-third of the weight of a rope-suspended bucket of equal capacity. In fact, it is impracticable to use a rope-operated bucket of anything like the size attained on these unloaders.

One particularly important point is the extremely low cost obtainable with these machines. Records extending over long periods show unloading cost ranging from 2½ to 4½ cents per ton, which includes superintendence, labor, and materials on the machine, as well as the cost for power and light.

On account of the high capacity of these machines, the number of units required is less by a considerable margin than of any smaller and lighter type machine, which results immediately in a decreased cost of operation, for the reason that a fewer number of skilled operators is required.

Again, on account of the extreme reach of the

bucket, it is possible for the machine to discharge a very much higher percentage of a ship's cargo than can be accomplished by ordinary rope-operated buckets. The bucket can be rotated at right angles to the hatch and reach out for ore which would be entirely inaccessible to an ordinary bucket.

It can be conclusively shown in plants where large tonnages are to be handled that there is a distinct saving in first cost, as well as a yearly saving in the cost of operation, over any other type of machine.

**Unloader Leg and Bucket at Work in Hold of a Modern Ore Vessel—Leg Can Rotate in a Circle, Allowing Bucket to Reach Out in All Directions, Taking Out as Much as 97% of Cargo Without Shoveling—Note Position of Bucket Operator Directly Above Bucket.**

This unloader is not a combined machine. It is an unloader, pure and simple, and does its work well.

## STREET-LIGHTING PROBLEMS OF LONDON, ENGLAND.

### Review of War-Time Restrictions—Now That These Are Removed, the Whole Street Lighting Should Be Improved.

Just before the outbreak of war a plea was made by the then president of the English Illuminating Engineering Society for the treatment of the lighting of the city of London as a whole and on a uniform basis. Leon Gaster, in opening a discussion on June 24 of this year before the same society, repeated the plea, because in view of the concerted action taken by street-lighting authorities throughout London during the war the moment was ripe for asking for a continuation and extension of such co-operation in the future. The suggestion was advanced that an advisory committee should be formed on which the Illuminating Engineering Society, the London Safety-First Council and the chief authorities interested, should be represented, in order to prepare recommendations for the lighting of London on a uniform basis and in accordance with commonly acceptable principles.

Reviewing the experience of the past five years, Mr. Gaster divided the treatment of street lighting in London during the war into three distinct periods: (1) A progressive and somewhat indiscriminate diminution in light by reducing the number of lamps lighted, and restricting the pressure of electricity or gas supplied to them. (2) A period when further diminutions were made by masking lights so that only a narrow cone of light was shed on the roadway in the vicinity of lamps. (3) The period when the authorities, acting on expert advice, substituted diffused lighting, by coating a portion of the lanterns with white distemper. The last of these methods helped to eliminate the objectionable contrasts in brightness and produced a more uniform effect. Immediately after the armistice a fourth period was entered upon, the restrictions relating to screenings being withdrawn and pre-war lighting rendered permissible, subject to 50% reduction in the interests of economy.

The public was naturally inclined to a restoration of pre-war conditions, but profit should be derived from the experience of war time by securing improvement as well as restoration after all restrictions were withdrawn on the signing of peace. From this experience two points standing out prominently were these: (1) The value of diffusing appliances in lessening glare and excessive contrasts in brightness; (2) the desirability of uniformity in practice as regards the principles of street lighting throughout the entire Greater London area.

The speaker referred to the relation of lighting to traffic. He showed figures indicating the effect of diminished lighting in increasing accidents. The London "Safety First" Council had emphasized the planning of street lighting in such a way as to avoid extreme contrasts in illumination in passing from a side street to a main street, or in passing from one borough to another. It had also emphasized the following points: The provision of special lighting to facilitate the guidance of traffic at important crossings, dangerous turns, etc.; the provision of light at regular stopping places for vehicles.

Mr. Gaster expressed the opinion that one of the best peace mementoes would be the placing of the light of London on a more satisfactory and uniform basis. Among other measures the permanent lighting by concealed lamps of public monuments serving as mementoes of the war might be suggested.

In considering general problems in street lighting it was held that much remained to be done in the design of fixtures, especially for use with the gas-filled lamp, which would doubtless be largely used for future street lighting. The distribution of light needed special care, but there was general agreement that the greater part of the light should be directed on the roadway, where it was chiefly needed. Street-lighting requirements were now quite different from what they were a few years ago, in view of the great increase in the volume of traffic and the high speed of motor vehicles.

On the question of the co-ordination of public and external private lighting, the speaker said that a difficulty in street lighting was the darkness of surrounding surfaces, which prevented good diffusion of light, occasioned sharp shadows, and accentuated the glare from light sources seen against this dark background. These conditions might be improved by co-ordination between public and private lighting. If suitably shaded and diffused, such external privately installed lamps would yield valuable assistance to street lighting. Municipalities might consider co-operation with consumers in main thoroughfares, allowing a concession in charges if requirements as regards uniform procedure in equipping lamps were adopted. Similarly, the appearance by night of important streets and squares would be much improved if some light, not necessarily a large amount, were allotted to the illumination by concealed lamps of public buildings, national monuments, etc. Another important factor was the illumination of nameplates for streets, and the more general use of mildly illuminated plates indicating the nature of buildings would also be helpful.

## THE INDUSTRIAL LIGHTING EXHIBIT AT N. E. L. A. CONVENTION.

**Important Demonstration of Poor, Fair and Good Factory Lighting at Atlantic City Exhibition.**

One of the features of the lighting exhibit under the auspices of the Lamp Committee and the Lighting Sales Bureau at the recent National Electric Light Association convention in Atlantic City, which attracted considerable attention was the novel industrial lighting demonstration. An entire room was fitted up to represent a small machine and repair shop, containing a lathe, drill press, grinder, sewing machine, and Ford truck chassis and engine. One half of the room was painted dark gray above the working plane, and black below, while the other half was flat white above, and green below. Three separate and independent systems of lighting were installed to show poor, fair, and good practice.

The poor lighting system consisted of four 50-watt bare carbon lamps on drop cords, one 100-watt clear-bulb Mazda C lamp on a drop cord over the bench at the darker end of the room, and one 40-watt Mazda B lamp on a long extension for working under the machine chassis. The intensity provided averaged 0.8 ft-cdl., which is far below that required by any of the state lighting codes. Such an installation, shown in Fig. 1, is typical of the practice in many shops where inefficient carbon lamps and high-candlepower Mazda C lamps without reflectors are commonly used.

The fair system of lighting, Fig. 2, is intended to show the result of an attempt to increase the illumination intensity without particular knowledge of good lighting. Two 150-watt Mazda C bowl-frosted lamps in deep bowl porcelain-enameled reflectors were used to provide the general lighting, and three units with similar reflecting equipment but smaller lamps were suspended on drop cords over the benches for local lighting. The lamps used for this purpose were two 60-watt Mazda B lamps and one 100-watt Mazda C. Such a system provides something like 2 to 3 ft-cdl. intensity and would meet the requirements of a state code. However, it does not provide for the best shop efficiency.

The good lighting system represented an installation designed to give "productive intensities." General illumination at more than double the intensity provided by the fair system was supplied from eight 150-watt Mazda C lamps in RLM dome reflectors. Four of these lamps were bowl-frosted, and four were equipped with opal caps. In connection with this installation, the sewing machine was fitted with a suitably shielded 10-watt Mazda B lamp, to show a possible need for local lighting when sewing on dark goods. On the other hand, this general overhead lighting system showed conclusively that no local lighting as required in the poor system was needed for a workman repairing an automobile engine.

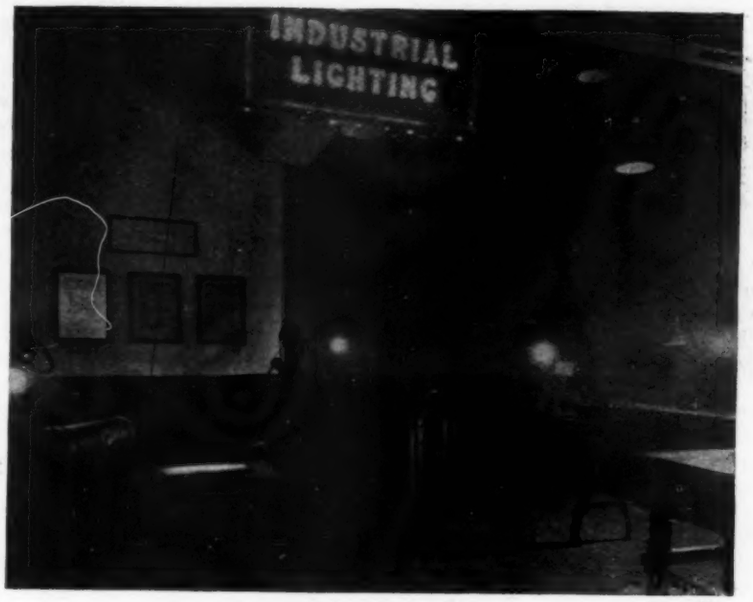



Fig. 1.—Deep Shadows and Gloom Prohibit Good Work Here.

During the exhibit a large model of a foot-candle meter was kept on the automobile chassis, to effectively show the change in intensity which occurred when the various systems were substituted one from another. The dual system of wall finish gave a convincing demonstration of the effect of white paint to increase the utilization of light and produce more cheerful surroundings.

Fig. 2.—Some Improvement, But Shadows Are Still Deep.

## SWEDISH DEVELOPMENTS IN THE USE OF ELECTRIC POWER.

**Electrification of All Railways Being Undertaken—Demand for Appliances and Equipment Increasing.**

Probably in no other country in the world, with the possible exception of the neighboring state of Norway, is there more intensive development in progress in the utilization of electrical energy than in Sweden.

There is in Sweden a remarkable tendency to apply the use of such power to every phase of the economic life of the country—to industry, to public utilities, to State and privately-owned railroads, to agriculture and to home life in remote districts as well as in the cities. The importance of the development is out of all proportion to population. Sweden's population is less than that of New York City, and is widely scattered over an area of 173,000 square miles, broken by mountains, and extending within the Arctic Circle.

Sweden possesses some coal, but it is not of the highest quality, and the supply is inadequate for domestic needs. Her immense forests are her greatest present source of national income, but the day has passed when wood fuel can be broadly and economically employed. War markets afforded great incentive to the expansion of old and new industries, yet the difficulty and cost of importing raw materials, especially coal, created a handicap which would have been insurmountable but for the driving power at hand in the Swedish lakes and streams. The value of existing and future development of this tremendous national asset has been emphasized by bitter experience.

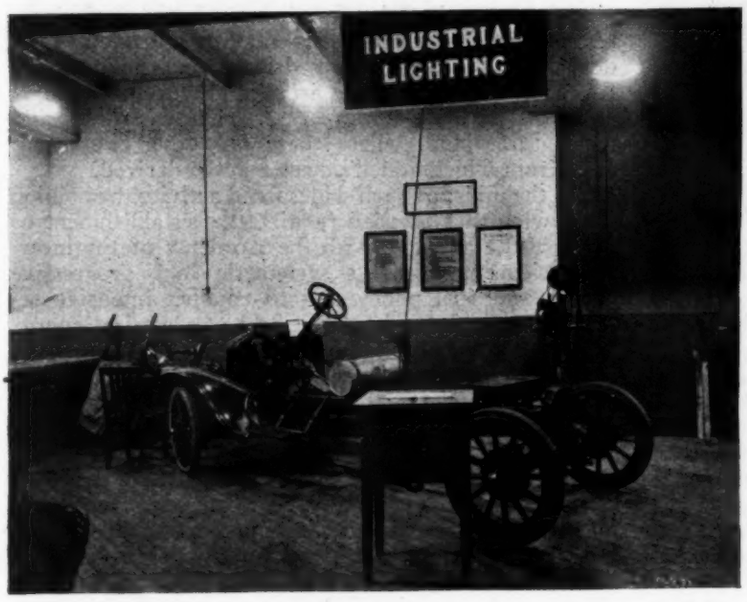



**Fig. 3.—Note the Absence of Dense Shadow, the Definition of Detail, and the Cheerful Atmosphere Under a Properly Designed System.**

Great strides were made during the war, and greater developments are planned. Sweden has seen a new vision of industrial and commercial greatness, but the past four years' experience has brought home to her the weakness of her position so long as she is dependent upon imported fuel. The solution lies in a full utilization of her magnificent "white coal" resources, the development of which is proceeding on a remarkable scale. There is no desire to repeat the war experience of running her railroads on wood, 40,000,000 cubic meters of which was consumed in 1917, or upon imported coal at 175 crowns ($46.90) per ton, the price in October, 1918. Power, comparatively cheap, abundant, and available with little regard to conditions abroad, will assist immensely in realizing the industrial and commercial possibilities.

The amount of water power normally available in Sweden may be conservatively set at 5,000,000 hp. Such a figure places her above any other country in Europe in this respect, with the exception of Norway. Water power has been used in her industries for centuries, and before the outbreak of war produced more than one-half of the mechanical power in the country, the total consumption exceeding 1,000,000 hp.

The demand for electrical energy has not been confined to any particular branch of industry. The call has been universal from the great iron mines of Norrland, within the Arctic Circle, to the extreme South, where power is already being transferred to Denmark by cable and still greater export is planned. The electrification of the railroads has already commenced and it is to be pushed as rapidly as possible. It is felt that trains must be made more rapid and the locomotives more powerful, to attain higher average speed rather than a greater maximum speed. In many cases of long hauls, as for instance, Stockholm to Kiruna, it is believed electric operation will cut the running time in half.

In 1915 the Government requested the Railway Department to make a thorough investigation and report on the question of electrification. The report, only recently completed, states that in view of the desirability of extending the existing system, the abnormal cost of fuel, and the greater efficiency and economy possible, the introduction of electric service is essential. It is estimated that the work will require ten years and it is proposed that separate conduits be established for lighting along the railways and for the distribution of power to agriculturists. It is felt that electrification would be profitable even were water power not available, since coal can be utilized in a steam power station with far greater efficiency than in the locomotive. Peat and inferior coal could also be used if necessary.

It has been estimated that the saving in fuel alone during the last four years, if the system had been electrified at the outbreak of war, would have equalled the entire cost of installation. Railroad coal, which cost $20 per ton in 1917, had risen to $46.90 per ton in October, 1918. The fuel item alone in the latter year amounted to nearly 70% of the entire cost of running the State lines in 1917, and largely accounted for the net deficit resulting from gross revenues never before approached in Swedish history.

Electrification has already been applied with a high degree of success. The first attempt on a large scale, aside from the electric street railways of such cities as Malmo, Göteborg, and Stockholm, was on the Kiruna-Riksgränsen line in Norrland, well within the Arctic Circle. This line is 93 miles long and carries annually a heavy tonnage of iron ore. Single-phase current at 80,000 volts is sent from the Government power stations at Porjus to four transformer stations along the line, of which the first is 87 miles and the last 160 miles distant. The voltage is stepped down to 15,000, at which voltage power is supplied to the contact device.

The freight locomotives in this case weigh about 100 tons and the passenger locomotives about 70 tons. A normal freight train includes 2 electric locomotives and 41 cars of 46 tons each, a total weight of 2000 to 2100 tons. Normal speed for freight is 18½ m.p.h. and the maximum 31 m.p.h. Maximum speed for passenger trains is 62½ m.p.h. In the first year of

operation the road transported 1,104,000 tons of ore, barely one-third of its normal capacity. In spite of this low traffic, a distinct saving over steam operation was scored.

For the electrification of railways seven main sources of power are available: Lagan; the Indal, Ume and Dal rivers, the power plants on the Lule river, the stream of Motala and the Göta river. Many of the existing installations are already fully loaded. Trollhättan, one of the two great State power undertakings, has been several times enlarged and now yields 150,000 hp. with a normal supply of water. It is said, however, that it will be fully loaded in 1921, though a complete system of water-economy and the regulation of Lake Vänern may increase the capacity to 300,000 hp. The Vargön Fall and Lilla Edet, also on the Göta river, are expected to yield 40,000 hp. and 65,000 hp. respectively. The first installment at Lilla Edet, to yield 26,500 hp., is already in process, the works being so planned that extensions can be made when needed.

The Motala works are being equipped for an initial yield of 10,000 hp. The Lule river has been estimated to be capable of producing 600,000 hp. The great Government plant at Porjus, which already supplies current for the Kiruna-Riksgränsen line in Noorland, will require its maximum capacity to meet projected railway and large-scale industrial demands in that territory. Works at Harspränget, also on the Lule, are planned on a basis of 150,000 hp., and the same river affords other falls worth harnessing.

It is further proposed to link up Trollhättan and the power system of East Sweden, called the Alvkarleby system, to permit a more complete utilization of all power generated in these widely separated regions. The State owns the important falls at Vargön and at Tyttbo, on the Dal, and it is proposed to harness them soon, as well as to regulate the level of Lake Vänern and undeveloped sites on the Dal. Other falls, such as those at Kerseforsen in the Lagan and Ljungsfallen on the Motala river, are being held in readiness to assist in the electrification of the railroads.

New power works completed during 1917 comprised about 65,000 hp., including a third instalment at Trollhättan of 26,500 hp. Works begun during 1918 called for 90,000 hp., including 25,000 hp. additional at Porjus. Stockholm has just begun to receive power from the new station near Untran, which cost the city about $8,000,000. The installation will deliver about 14,000 kw. and is said to effect a saving of $4,000,000 annually in coal. The transmission line has a voltage of 100,000, greater by 30,000 volts than the previous pressure.

The Torpshammer Aktiebolaget is building a new power plant at Torpshammer (Sundsvall) to develop 30,000 hp. to supply the growing industries at Svartik. While a new company, with headquarters at Norrkoping and a capital of $800,000, it expects to effect a more efficient distribution of the energy already available to certain districts in Oestergotland. Still another power station is projected at Agnas, near Bjursholm in the county of Vasterbotton. The company involved has a capital of $26,800, but no information is available as to the capacity of the installation. The marked tendency of Swedish industries toward consolidation is instanced by the recent formation of the Aktiebolaget Bergalagens Combine Power Control, a combination of 33 of the largest power producers of central Sweden. The purpose of this body is at present said to be rather the more complete utilization of the existing productive capacity of its members than the construction of new stations.

It is interesting to note the growing effort to provide electric power throughout Sweden for other than industrial requirements. The Railway Department's report upon the electrification of the roads recommends the distribution of power to argiculturists, while the whole question of the electrification of country districts has now been taken under detailed consideration by Royal Commissions, by county councils and by various agricultural societies. The councils in particular have been urged to take a more general interest in those districts particularly suited for the spreading of information and the formation of the necessary organizations. It is hoped that by such means, coupled with the creation of free ports and the improvement of the existing canal system by which many inland industrial centers may be stirred to greater activity and made accessible to ocean shipping, home markets for Swedish products, particularly textiles and household goods, may be extended. The development of electrically driven roads in northern Sweden, where immense iron mines are located, is expected to open up great stretches of forest and agricultural land, where there are other important falls from which added power may be derived.

In the midst of such widespread activity the opinion is growing that Sweden requires the establishment of an Institute affiliated with the Academy of Engineering Science to draft a systematic and progressive power and fuel policy and to conduct intensive research work throughout the field of electrical energy and its application. This movement apparently has the hearty support of the press and the Water Power Commission.

The latter body, granted $2,200,000 in 1918, asked an additional $268,000 for the purchase of further sites, etc., the same amount for the current year, and $690,000 for 1920, to be used in the construction of new power stations and the improvement of existing plants. Apparently the appropriations sought had reference to the new stations planned at Tyttbo and Umea and extensive improvements at Norrforsarna and Sorforsarna Stations.

To foster such development as has been outlined above the Swedish Government has recently created the State Water Power Loan Fund and the State Power Transmission Loan Fund, with yearly grants of 2,000,000 kroner and 1,000,000 kroner respectively.

The stated purpose of the first fund is to permit loans up to two-thirds of the cost of harnessing waterfalls belonging either to the State or to private individuals and for the regulation of water levels; the last is for loans to co-operative associations for the building of distribution systems and power-transmission wires. It was found, however, that the appropriations were insufficient, since applications under the Transmission Loan Fund soon reached 6,000,000 kroner. The Board of Trade and the Board of Agriculture, in a joint memorandum, have asked that the sums available be doubled during 1919 and 1920 in order to permit greater assistance in the electrification of the country districts.

The above indicates something of the magnitude of existing and projected hydroelectric development in Sweden. Progress during the war would have been even more rapid but for the difficulty of importing finished equipment and raw materials required for domestic manufacture of turbines, dynamos and other machinery. Such articles as lamps, fuses,

switches, electric motors, and numerous other items had been almost exclusively imported from Germany. The electrical industry, for a long time very important in Sweden, expanded as greatly during the war as the shortage of raw materials would permit, but the sudden accession of interest in electrification and industrial expansion throughout the country has created a great demand for mechanical and electrical appliances of all kinds.

The production of the heavier types of machinery required is an important industry in Sweden, but the drop in her German imports in many allied lines has been seriously felt.

Heretofore, Sweden has paid heavy toll to Germany for her lack of direct shipping connections with outlying countries. Plans now being formulated will bring Swedish ports into direct and regular communication with this country and the new policy of her big men is predicated upon the cultivation of closer commercial and financial relations with the United States.

The rapid development of the electro-metallurgical and chemical industries in Sweden is reflected in the following table:

| Year. | No. Plants. | No. Kilowatts. | Value Product (Kroner). |
|---|---|---|---|
| 1904 | 8 | 9,000 | 4,500,000 |
| 1908 | 10 | 13,500 | 7,500,000 |
| 1911 | 14 | 25,000 | 11,000,000 |
| 1913 | 22 | 60,000 | 20,000,000 |
| 1915 | 36 | 78,000 | 31,000,000 |
| 1917 | 75 | 128,000 | 55,000,000 |

Prior to the war our part in supplying electrical equipment to Sweden was almost nil. The following figures show the importance of the trade from the German standpoint. It is only in the past two years that our share has grown appreciably and it would appear to be entirely up to the American exporter of these commodities whether the figures rise to new heights or fall back to their old level.

GERMAN EXPORTS TO SWEDEN.

| | 1909 | 1910 | 1911 | 1912 | 1913 |
|---|---|---|---|---|---|
| Electric Cables | $1,023,000 | $1,021,000 | $752,000 | $565,000 | $500,000 |
| Electric Appliance for Illumination, Transmission of Power, etc. | 188,000 | 262,000 | 334,000 | 340,000 | 481,000 |
| Electric Incandescent Lamps | 340,000 | 329,000 | 513,000 | 373,000 | 406,000 |
| Electric Meters, Registers, etc. | 99,000 | 151,000 | 189,000 | 217,000 | 261,000 |

U. S. EXPORTS TO SWEDEN.

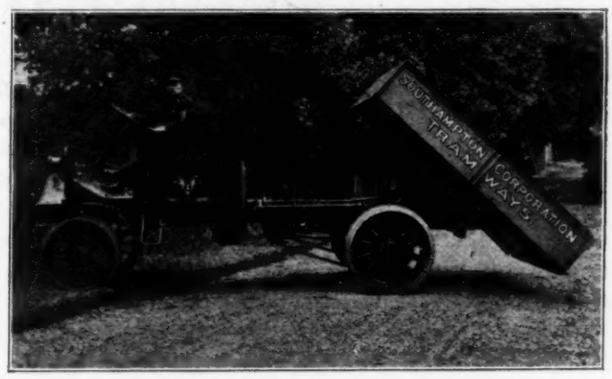
| | 1913. | 1914. | 1915. | 1916. | 1917. |
|---|---|---|---|---|---|
| Batteries | ..... | $ 569 | $ 3,809 | $ 537 | $ 8,540 |
| Dynamos or Generators | 48 | ..... | ..... | 1,168 | 17,359 |
| Ins. Wire and Cables | ..... | 1,253 | 535 | 1,276 | 29,406 |
| Meters, other Meas. Instruments | ..... | ..... | 2,000 | 1,858 | 1,150 |
| Motors | 5,298 | 1,400 | 6,400 | 711 | 11,000 |
| Transformers | ..... | 30,113 | ..... | ..... | ..... |
| All other | 5,500 | 10,700 | 19,000 | 31,500 | 88,500 |

In spite of the handicaps of the war period, Swedish private enterprise and the purchasing power of the people have increased, and her labor situation appears more favorable than that of her neighbors. A period of temporary depression must follow the speculation and rapid expansion of the war years, but Sweden's future for the long pull never appeared brighter than at present.

## STORAGE-BATTERY DUMPING WAGON FOR SOUTHAMPTON TRAMWAYS.

The accompanying illustration shows a 2-ton electric battery dumping or tip wagon that is in use on the municipal electric tramway system at Southampton, England. It is employed for permanent way and general carting work. It was introduced during the earlier years of the war and our picture which was then on the way to the ELECTRICAL REVIEW was intercepted by the British postal censor and in due course found its way back to our British correspondent. It is not apparent on the face of it what secret intelligence the said censor imagined the picture was intended to convey, but as the press postal censorship was recently withdrawn, we are now enabled to leave the reader to solve the riddle.

W. T. Robson, general manager and engineer of the tramways, tells us that the vehicle has been in daily service for three years without a break and is still running satisfactorily. Writing to our correspondent in August, 1916, Mr. Robson said that there was ample




Southampton's Battery Truck Dumping.

evidence to show that a considerable financial saving would result. In reply to an up-to-date inquiry, he says: "We have not worked out any recent costs, but I may say that the vehicle has displaced three horses, carries out all our own carting work, and in addition we are able to loan it for the benefit of other departments to a very great extent indeed."

The chassis is of the ordinary G.M. 2-ton type and the battery equipment consists of 60 type A8 Edison cells. An electric tower wagon of similar type had previously been put into service with equally good results.

## FRENCH MARKET FOR ELECTRICAL GOODS.

Prior to the war a considerable amount of electrical goods was imported from Germany by French dealers in competition with other dealers handling French-made goods. It is thought that most of the inquiries in this line now come from the former class of dealers, who have lost their connections and who, naturally, have no claim on French manufacturers already represented. The French houses are more nearly fireproof than American houses and the same precautions do not have to be taken, so that American dealers exporting to France will have to furnish French patterns in several fittings that differ essentially from American practice. Among the more common instances will be: Bayonet sockets instead of screw sockets, tumbler switches instead of snap switches, sheet-metal tube with crimped joint and lined with treated paper instead of heavy metal conduit. This light conduit employs sleeve unions instead of screwed joints.

There have been inquiries regarding the conduit mentioned above, which is scarce in France at present. Other inquiries refer to: Multipolar snap switches, flush-type push-button switches, all fittings requiring hard rubber in their manufacture, high-candlepower low-voltage incandescent lamps for motion picture machines.

# Editorial Comment

## Index to Volume LXXIV Ready

THE index to Volume LXXIV of the ELECTRICAL REVIEW, comprising the 26 issues from January 4 to June 28, 1919, inclusive, is now ready for distribution. A copy will be sent to any subscriber upon request to the publishers.

## Caution in Institute Changes

NUMEROUS changes in the activities of the American Institute of Electrical Engineers were discussed at the recent Lake Placid convention, as reported in this issue. These matters should be given most careful consideration and no hasty decisions arrived at without knowing that they meet the wishes of the great mass of the members and are for the good of the Institute. We urge special caution respecting any changes in the Institute's publications and doubt the wisdom of radical action on this matter.

## Burglar Alarms Needed

AS LONG as we have inadequate police protection, crooked criminal lawyers, spineless judges and juries, we may expect a recurrence of raids on banks, paymasters and jewelers by daring automobile bandits. These victimized interests must therefore safeguard themselves as best they may. An excellent help in this line is a reliable burglar alarm. The bandits depend on their automobile for a quick escape. A speedy alarm is therefore an essential to their capture. A loud alarm sounded during the raid is likely to scare the criminals before they can effect their robbery, as has happened on several occasions where banks were equipped with reliable alarms. Electrical contractors can therefore aid the community by installing such alarms.

## Economical Ore Handling

ONE of the principal reasons why the American iron and steel industry has forged ahead so rapidly is its very extended use of labor-saving machinery, nearly all of which is now being electrically driven. The use of motor drives in rolling mills and around blast furnaces and open-hearth furnaces has been frequently discussed, but the use of electricity in unloading ore vessels, while little less spectacular, is not so well known. In an illustrated article in this issue we describe the construction and operation of some gigantic electrically operated ore-unloading machines that have proven extremely economical in service. With two operators, one of these machines does the work that formerly took a small army of shovelers and barrow or truck pushers, and the work is done very expeditiously. In one case eight machines unloaded seven ore vessels totaling a load of 70,000 tons of ore within 22 hours. Such performances as these obtained through efficient, powerful machines electrically driven will keep our iron and steel industry in the forefront in the international competition for business in spite of high wages to the operatives.

## Electric Brass Furnaces

FOR many years considerable attention has been devoted toward reducing the high loss of volatile metal that occurs in melting brass and cuprous alloys. One of the ways of reducing this loss, the latest and best, is to use the electric furnace instead of furnaces employing coal, oil or gas.

The huge demands for brass and its alloys created by the war resulted in effort being concentrated upon evolving a furnace that would do away with the extravagant waste of zinc in the process of producing castings and alloys. Out of this has come the electric brass furnace of today, of which there are a number on the market.

The electric brass furnace, like the steel furnace, represents a good load-factor and a comparatively heavy load. The capacity of the brass furnace is smaller than the steel furnace in units made so far, and there are many reasons why they may be expected to always remain so. There are many foundries scattered over the country—and we have often said before that the foundry is the one place where the electric furnace ought to be—where brass can be melted electrically with a big saving in zinc loss and all that goes with it.

## Handling Competing of Merchandise

THE article by Mr. Thomas J. Casey in this issue contains some very interesting suggestions for the electrical contractor who is considering the establishment of a retail store. The recommendation that dealers do not handle competing lines of merchandise is well taken as the tendency in merchandising in the electrical industry is decidedly along these lines. Manufacturers are finding it desirable to give exclusive sales rights to jobbers who do not handle competing stocks, and likewise many jobbers are giving serious consideration to the policy of entering into agreements with dealers in different localities to represent them exclusively.

Electrical dealers can do no better than adopt the successful policies of the manufacturers and jobbers and benefit from their experiences.

It is well known that electrical appliances require intelligent selling, but little opportunity is given the

salesman to exercise intelligent selling if, as in the case of a flatiron, the final choice between from one to a dozen different makes must be left to the customer. In spite of the great progress that has been made, the average housewife knows very little about electrical appliances. If a prospective purchaser enters a store for the purpose of buying an electric iron and asks the salesman which is the best, he is placed in a very difficult position if his house handles several different makes of the same size. It is far more satisfactory from every standpoint and undoubtedly productive of less confusion to be able to answer that one make has been selected as the most satisfactory for their customers and endeavor to make a sale on this basis. If the customer desires a particular make of product it can either be secured or it is better to have the customer go elsewhere.

The most successful retailers in other industries have almost universally adopted this policy of handling non-competing lines. It would be well for electrical merchants to give serious consideration to this matter.

## *The Progress of the Contractor-Dealer Association*

ANYONE who has kept in touch with the activities of electrical contractor-dealers as reflected through the workings of the National Association of Electrical Contractors and Dealers cannot help but be impressed with the substantial progress that has been made by this branch of the industry during the past two years. Largely through the efforts of Mr. William L. Goodwin and his loyal supporters the electrical contractor has been rejuvenated, and today is also a progressive dealer rapidly adopting all of the modern principles of merchandising.

There are still many electrical contractors who refuse to advance and who were apparently satisfied with the chaotic conditions that existed a few years ago. And there are still so-called electrical dealers who maintain that the distribution of electrical merchandise should be confined to them, although they make practically no effort to modernize their business and keep abreast of the times. These same contractors and dealers are usually the first to complain of competition from central stations and others and to demand the same liberal treatment from manufacturers and jobbers. Needless to say, these contractors and dealers are the ones who most need the Association and it is hoped that the influence of the forthcoming convention at Milwaukee will reach out to these men.

In his notable address at the New Orleans convention two years ago Mr. Goodwin among other things pointed out that there is strength in numbers and that if the contractor-dealer fraternity desired to arrive at and maintain its place in the industry, it must build up a strong organization. The National Association of Electrical Contractors and Dealers has justified itself from every angle, and it will undoubtedly be but a short time before membership in the Association will characterize a contractor-dealer as one worthy of a place in the industry.

## *Service Costs and Rates*

WHEN central-station service was in its infancy there was no knowledge of what it cost to furnish it and the rates established for it were set arbitrarily at such figures as were believed to insure at least a fair profit. For a great many years this condition continued, central-station companies making little or no attempt to ascertain what it cost to serve different classes of customers and often not knowing till the end of each year whether a profit or deficit had resulted from the year's operations. As a consequence of setting rates chiefly by guesswork, there were frequent discriminations not only between different classes of customers, but also among the customers of each class.

This condition was true likewise in the case of other utilities and was one of the causes that led to the adoption of commission regulation of public utilities. As such regulation has developed during the last dozen years it has been instrumental in bringing about a complete change in the making of utility rates. Instead of setting these arbitrarily without any consideration of the actual cost of rendering the service and charging as much as it was believed the customer would stand without quitting the service, it is now usual to make a careful analysis of the costs and then set the rates so that no class of customers is served at a loss and so that there is left enough margin over the cost to insure a reasonable return on the investment. Therefore, before discussing how rates shall be fixed it is necessary to study how the costs can be analyzed to show the various elements of cost affecting each class of service.

It is this order of treatment that has been adopted by Mr. H. E. Eisenmenger in his series of articles on "Central-Station Rates in Theory and Practice," which begins in this issue. Although part of this first article may seem elementary, it is necessary to know the fundamental principles before their application can be intelligently considered. These fundamental principles can be applied to any kind of utility service; for instance, the author shows their application to postal service—a branch of utility service that is claimed to be greatly in need of cost analysis. A preliminary study of the principles as applied to electric rates is also made in this installment, which will be carried out in detail in future articles of the series, which are to appear weekly, as announced in our last issue. We believe that, as we then stated, our readers will find these articles not only timely but highly informative. An introduction to the series written by Mr. S. E.

Doane, chief engineer of the National Lamp Works, with whom Mr. Eisenmenger was associated for some ten years in rate researches and investigations of similar central-station problems, has unfortunately not been received in time to be included at the beginning of the series. It will be inserted in due time, however, without seriously affecting the continuity of the articles. It is hoped, in fact, that it will add interest to the articles and emphasize the importance of thorough consideration of the subject.

## *Automatic Telephony Coming to Rescue*

TELEPHONE companies are facing a problem of rapidly increasing difficulty in connection with maintaining their operating organizations in efficiency and strength. This is especially true of the larger cities. To train an operator to take care of her work properly and efficiently has usually required special instruction for several weeks or even months, and the large telephone companies have for many years been compelled to maintain, at considerable expense, operators' schools for training the large number of beginners continually needed to replace recurring gaps in the operating force.

There are several reasons for the forming of these gaps as soon as they are filled. One of the principal ones is that men readily appreciate a pleasant voice and courteous attention when it comes via wire, so much so that many even confirmed bachelors have fallen victims to the frequently unintentional charmer. In short, the percentage of marriages among telephone operators is probably higher than among any other class of gainfully employed young women. Strangely, however, this is not true of telephone operators in several other countries, for in a number of European countries it has become customary to keep spinsters and widows at operating work until they reach the ripe age of 70 or thereabouts. American operators' schools have perhaps been too efficient in developing in the girls not only courtesy and alertness but also amiability and poise.

Another reason for the gaps among operators is that most companies have not been able to pay very high salaries for the services of the operators, so that these remained on the alert for opportunities in other occupations that brought greater remuneration. Other girls found the work too strenuous for their nervous temperaments. The companies have tried to make the work less exacting and, by giving frequent rest periods and furnishing pleasant rest rooms and lunch rooms, have done their utmost to develop the welfare of the girls as well as their interest and pride in their work. But the gaps are no sooner filled than they open again so that there is a continual procession of girls training, working a short time and quitting. Needless to say, this high labor turnover is an expensive burden to the operating department and incidentally accounts very largely for justifiable complaints of poor service.

On top of these difficulties, which have become aggravated during the war because of the tempting salary offers in numerous other occupations, have recently come concerted demands for higher compensation, culminating in a strike in at least one city—Boston.

Over 25 years ago some of these difficulties were foreseen in the earliest inventions that aimed to replace the human element in telephone operating by means of automatic machinery. During the intervening years there have been great advances in automatic telephony. Several systems have been developed, of which at least one has come into quite extensive and successful use. The service rendered by the "girlless" 'phone is surprisingly prompt, free from wrong connections and cutoffs, and satisfactory in every way. It has been shown that there is no feature of telephone service that cannot be furnished through the automatic instrument; long-distance, information and emergency calls can be handled by a small number of operators. Foreigners unfamiliar with our language and people with impediments in speech can secure their connections much more readily than with a manual system. The perfected automatic telephone exchange equipment is a marvel of invention on a par with the linotype machine or printing telegraph and equally with these ingenious mechanisms a striking achievement in labor-saving apparatus.

It is not surprising, therefore, that the executives of the largest telephone companies have at last turned to automatic telephony to rescue their operating departments from their increasingly desperate situation. It has been understood to be the new policy of the large Bell companies to change over to automatic equipment those exchanges that have the heaviest traffic, incidentally making other rearrangements of offices, cables, etc., as would promote economy. It is not right to assume that these companies did not recognize the advantages of automatic telephony many years ago. They had a peculiar situation to face in that many millions of dollars of investment were tied up in their manual switchboards and the sudden change to automatic would mean not only losing much of this capital through discarding of the manual equipment, but also necessitate securing great amounts of new capital to purchase the automatic apparatus.

Now, however, because of the increasing cost of manual service, the economy in operation from adoption of automatic service will be greater and it becomes financially expedient to change over, since this economy will within a reasonable time offset the interest on the additional capital investment. Consequently, we shall see more and more use of the automatic telephone in our large as well as medium sized cities, this being but another instance of the use of electrical machinery to replace more and more costly and fickle manual labor—a development that is making rapid headway now and will continue to accelerate in the future.

# Current Events

## *Plans for Contractor-Dealer Meeting—American Institute Discusses Organization—Trumbull Electric Changes Hands*

### LARGE ATTENDANCE EXPECTED AT MILWAUKEE CONVENTION.

**Arrangements Completed for Nineteenth Annual Convention of National Association of Electrical Contractors and Dealers—Comprehensive Program of Papers.**

Final arrangements have been completed for the nineteenth annual convention of the National Association of Electrical Contractors and Dealers, which will be held at the Hotel Pfister, Milwaukee, Wis., during the week of July 14. As previously announced in the ELECTRICAL REVIEW, Monday and Tuesday will be taken up by meetings of the Executive Committee, the first general session being on Wednesday morning. An address of welcome will be made by Gov. E. L. Philipp of Wisconsin and Chairman C. W. Peet will respond. An address on "Co-operation in Business" will be made by Frank B. White, of the National Agricultural Publishers' Association, and Frank Stockdale will speak on "Keeping Up with Rising Costs" at the afternoon session on Wednesday. The meeting on Thursday will be held at Waukesha Beach, the principal address being by W. L. Goodwin on "Merchandising Opportunities." A number of interesting reports and addresses dealing with various phases of contractor-dealer activities have been arranged for Friday.

The entertainment includes a reception and dance at the Hotel Pfister on Wednesday evening, sports and games at Waukesha Beach on Thursday afternoon, and an informal dinner on Friday evening. Announcement has been made that there will be special entertainment features for the ladies.

W. H. Morton, general manager of the Association, anticipates the largest attendance in the history of the organization.

### CLOSING SESSIONS OF A. I. E. E. CONVENTION EMBRACE MANY SUBJECTS.

**Discussions of Papers, Publication of Periodicals and Changes in Activities Some Topics.**

The concluding sessions of the A. I. E. E. Convention at Lake Placid (the first two days' sessions were presented in last week's issue of the ELECTRICAL REVIEW) comprised discussions of papers and the making and discussion of proposals to change the existing mode of issuing Institute publications and broaden the activities of the Institute.

#### TRANSMISSION AND DISTRIBUTION TOPICS RECEIVE DISCUSSION.

After the presentation of the Transmission and Distribution Committee's report by E. B. Meyer on Thursday morning a spirited discussion on the dissipation of heat from cables and its effect on insulation took place. W. A. Del Mar spoke of the urgent need for specifications for paper and varnished cambric insulation. He recommended a study of the relative current-carrying capacities of cables in duct and earth. D. W. Roper emphasized the necessity of determining whether cables come up to A. I. E. E. specifications. P. M. Lincoln said that local conditions are so important that this problem devolves more upon the operating rather than the manufacturing company, and co-operation between the two is needed.

R. W. Atkinson said that copper temperatures may be determined when duct temperature, sheath temperature, cable load and characteristics are known. Professor Clark urged that funds be furnished to enable research to be carried on that will enable insulators of higher standards to be produced. C. P. Martin advocated that a standard method of testing high-tension insulators be adopted by the Institute.

H. R. Summerhayes pointed out that excessive heating of a few seconds from short-circuit currents may have a serious effect upon insulation. Colonel Jewett, of the Western Electric Co., spoke of research on insulating materials now being carried on under the auspices of the National Research Council. The success of this venture depends almost entirely upon the co-operation obtainable from the manufacturing and operating companies concerned. Dr. Steinmetz stated that, in his opinion, porcelain does not age; but it is the unequal expansion and contraction of the composite parts, namely, cement, porcelain and metallic pins, with temperature changes that is the seat of trouble in causing insulator deterioration. C. S. MacCalla told of an interesting experience of the Central Colorado Power Co. A large number of link insulators are used on the 100,000-volt lines. With this type of insulator, as distinguished from the cement-pin type, after correcting for failures from lighting, failures due to aging were only one-tenth of 1%.

The papers on "High-Tension Single-Conductor Cable for Polyphase Systems" and "The Dielectric Field in an Electric Power Cable" by W. S. Clark and G. B. Shanklin and R. W. Atkinson, respectively, were discussed by H. W. Fisher, Standard Underground Cable Co.; W. A. Del Mar, Electric Cable Co. and Habirshaw Electric Cable Co.; Philip Torchio, New York Edison Co.; D. W. Roper, Commonwealth Edison Co.; H. L. Wallau, Cleveland Electric Illuminating Co.

W. A. Del Mar presented a diagram showing electrical lines of force and heat flow around both sector-type and circular three-conductor cables. This showed that dielectric stress is about 15% greater in the round than in the sector type cable. The heat resistance from conductor to air is about 3% less for the sector than for the round conductor cable. The current-carrying capacity will be, therefore, from 1 to 2% greater than that of the round conductor cable.

Philip Torchio thought that Messrs. Clark and Schanklin were mistaken in saying that three-conduc-

tor cable is less advantageous than single conductor. Single-conductor leaded cables have a number of disadvantages, namely, the higher voltage impressed in the sheath with undergrounded sheath and the high charging current when the sheath is grounded. H. L. Wallau gave specific data as to sheath current and reduced voltages.

A. E. Silver's paper on the subject of "Problems of 220-Kv. Power Transmission," excerpts from which appear in this issue, brought out considerable discussion, the consensus of opinion being that such a voltage was practical, and that conditions already exist where systems similar to those proposed could be adopted.

W. S. Murray, formerly electrical engineer of the New Haven Railroad and conservation engineer for the government, in the discussion referred to a superpower line which is proposed between Washington and Boston to serve a territory measuring about 450 miles long by 150 miles wide as a concrete opportunity for application of 220 kv.

A. F. Bang said 220,000-volt transmission lines without spare transformers is considered unwise. He favors single-phase transformers in preference to large three-phase transformers for this service. He also questioned whether external cooling of transformers is justified in every case.

F. W. Peek, Jr., expressed the belief that a line built according to the plan outlined in Mr. Silver's paper would be more reliable than present 33,000-volt lines, and that link-type insulators will overcome most objections to insulators.

J. F. Peters spoke of several factors which being of no consequence at low potentials become serious in the design of high-voltage apparatus, one of which was electrostatic field. Short-circuit stresses will be less severe on high-tension transformers because of the greater magnetic leakage.

A number of speakers favored grounding the neutral of Y-connected systems. Others taking part in the discussion were Philip Torchio, New York Edison Co.; H. B. Dwight, Canadian Westinghouse Co.; A. F. Bang, Pennsylvania Water & Power Co.; S. Warren Mauger, R. M. Spurck and F. F. Brand, General Electric Co.; G. I. Gilchresh and R. P. Jackson, Westinghouse Electric & Mfg. Co.; J. C. Clark, Stanford University; C. F. Harding, Purdue University.

### Technical Committees to Have Wider Field of Activity.

Wilfred Sykes, chairman Board's Committee on Technical Activities, stated in his report that the technical committees might to advantage do more than arrange for the presentation of papers, that is, in addition collecting and correlating data, formulating rules, etc. As this sort of work requires considerable time, it would be necessary for committee members to hold office for a longer period of time than one year, as at present. This line of thought was continued by Dr. Steinmetz, who said that the chief value of committees is to supply extensive reviews of developments in their special branches of science or applied science, in such form that it is get-at-able. He made mention of the reports of the N. E. L. A. and the Association of Edison Illuminating Companies, stating that such reports are much more desirable than individual papers. The presentation of individual papers should be made to assist final committee reports, which ought to be more full than is now generally the case. Such a scheme of things would broaden engineers. Only workers should be retained on committees.

Prof. Karapetoff suggested that a research committee be established to act as an intermediary between the National Research Council and the A. I. E. E., taking up individual problems that come up before the technical committees. As the best work is done by individual geniuses rather than by committees, Prof. Karapetoff thinks it inadvisable to dispense entirely with individual papers. David B. Rushmore said that one of two purposes is open to the A. I. E. E. One is to supply every electrical engineer with information he wants. The other, to allow specialists to form separate organizations. The question, therefore, is whether the Institute should enlarge its activities and become an inclusive body or confine its attention to those engineers who are not specialists and become a residual body. He suggested that section chairmen recommend eligible committeemen stating their connections and abilities for work. The performance of each committeeman should be recorded, that the inactive members may be dispensed with. L. W. Chubb offered an alternative method, namely, to select each chairman from the preceding committee, choosing the remaining members on the basis of their former activity.

### Discussion Centers Round Development Committee's Report.

The presentations made by the Development Committee in which it was proposed to modify and extend the present activities of the Institute, received a large amount of discussion. Calvert Townley, chairman, pointed out that the principal proposals comprised the substitution of the present monthly proceedings by an engineering periodical; the creation of geographical sections, each represented by a vice-president; rotation of monthly meetings instead of holding them at New York City; federation of local engineering for better co-ordination under national council; holding of regular engineering congress, and decentralization of work. It is proposed to eliminate the publication of Institute papers other than those presented before the general meetings, and papers presented before sections will be abstracted. Articles of general engineering interest and abstracts of papers presented before allied associations will be included in the publication that has been proposed to substitute for the monthly proceedings.

In the discussion on this matter of the Institute periodical, the consensus of opinion seemed to be against doing anything that would tend to lower the present high standard of the Institute's status and its publications. Dr. Steinmetz said he would very much regret seeing either the size or the quality of the Proceedings changed after having retained their present form for 35 years. The proposal to change the form of periodical instead of the publication as issued by the Institute would undoubtedly lower the prestige of the Institute, while soliciting advertising would have many drawbacks. Without adopting the radical steps proposed, it was his opinion that a portion of the $18,000 now expended in binding the transactions could be saved in other ways.

Mr. Vincent, who was supported by Prof. Clark, suggested that it would be better to increase the revenue rather than to curtail the expenditure in the way proposed. He suggested that this might be done by elevating the membership of those persons now below the rank to which they are entitled. Prof. Clark suggested that the cost of binding the transactions should

devolve upon the members. L. T. Robinson pointed out that the Institute papers are the most interesting part to many members at present; that young engineers do not have to be attracted by popular articles; and that it was not the intention of the proposed Institute organ to parallel the work of existing engineering periodicals. Mr. Chubb expressed it as his opinion that it would be a great pity to change the present type of technical papers. He failed to see how popularized or generalized papers would be able to supplement present technical ones if a monthly periodical is to be maintained.

Prof. Karapetoff, speaking very strongly, said it would be suicidal for the Institute to adopt any course with a downward trend. The present high standing of the Institute should be maintained. Popularized and generalized information is well taken care of by the present engineering publications that are alike available to everybody. If a publication such as the Development Committee proposed was to be issued, it would have to compete with technical papers now issued by skilled and shrewd business men whose business is publishing and who are equipped with stable and liberal personnel. Dr. Steinmetz pointed out that papers presented before the Institute should be of the highest calibre. Mathematical and theoretical papers are the ones which give prestige to the Institute and permanent value to the Transactions. Inventions, discoveries and developments; theoretical and experimental investigations; and the operation and installation of equipment should also be subjects for discussion so long as they represent the forward step. He suggested that it would be of immense benefit if all papers of affiliated societies could be made available in condensed form. Papers might be accepted on the basis of their abstract value.

A vote was then taken to accept the proposals regarding an engineering publication, as submitted by the Development Committee. President Adams, Philip Torchio and others expressed themselves as being strongly opposed to the inclusion of advertising matter in the Institute's Proceedings.

## C. G. DU BOIS NOW PRESIDENT OF WESTERN ELECTRIC COMPANY.

**Succeeds H. B. Thayer, Who Retires After 38 Years to Become President of American Telephone & Telegraph Co.**

At a meeting of the Board of Directors of the Western Electric Co. held on July 1, Charles G. Du Bois was elected president of the company to succeed H. B. Thayer, who has resigned after 38 years of service to assume the presidency of the American Telephone & Telegraph Co., as announced in our issue of June 28. Mr. Thayer was elected chairman of the Board of Directors of the Western Electric Co.

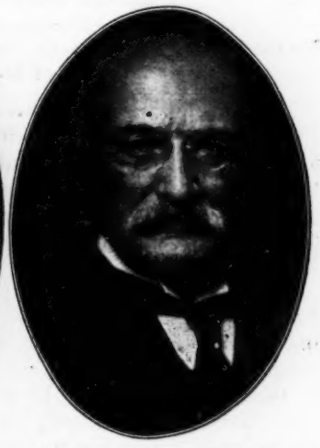
Mr. Du Bois was born in 1870. After his graduation from Dartmouth College in 1891, he joined the Western Electric Co. in New York City as a clerk in the accounting department, and in 1896 he was appointed chief clerk at the New York office. In 1898 he was elected secretary of the company with offices at Chicago. This work carried with it a general supervision of the entire accounting system of the Western Electric Co.; and in this connection Mr. Du Bois was largely instrumental in working out and securing the adoption of the company's first pension plan.

Shortly after assuming the duties of secretary, Mr. Du Bois was also made supervisor of branch houses. This carried with it the opening of a large number of distributing houses, which are now a part of the company's organization.

In 1907 Mr. Du Bois was transferred from the Western Electric Co. to the American Telephone & Telegraph Co. as its comptroller. In this capacity he inaugurated and supervised a new and comprehensive system of accounting for the Bell Telephone System. In 1917, shortly after the entry of the United States into the war, he went to Washington to serve as comptroller for the American Red Cross. After systematizing the Red Cross accounting work and organizing a department to carry it on, he resumed his duties with the company.

On Oct. 1, 1918, Mr. Du Bois rejoined the Western Electric Co. as vice-president, which office he held until his accession to the presidency. Mr. Du Bois' long association with Mr. Thayer in the administration of the company insures a continuity of policy and methods in the conduct of the business.

Chas. G. Du Bois, the New President.



H. B. Thayer, Retiring President.

## TRUMBULL ELECTRIC REPORTED AS SOLD TO GENERAL ELECTRIC.

**Trumbull Electric Manufacturing Co., of Plainville, Conn., to Form Part of General Electric System—Plant to Be Enlarged.**

According to a reliable Hartford, Conn., newspaper, control of the Trumbull Electric Manufacturing Co., Plainville, Conn., has been acquired by the General Electric Co. The capital stock of the Trumbull company has been $500,000 and its surplus about as large. It is stated that the General Electric Co. will increase the capital, enlarge the plant and greatly extend its business.

The Trumbull Electric Manufacturing Co. is one of the best known manufacturers of switches, panelboards, switchboards and other electrical supplies. It has been very successful since its modest beginning in 1899, when the three brothers, John, Henry and Hugh Trumbull, opened a small factory in an abandoned barn in Plainville; the capital invested was about $250 and six or seven workmen were employed. Within a year the company replaced its wooden factory with a more pretentious brick building and increased its em-

ployes to about 40. At present the plant consists of two large four-story buildings with a connecting building of the same height. It is the principal industrial establishment of Plainville and has employed about 500 workers at the time of maximum activity during the war.

Of the Trumbull brothers, Hugh sold his interest in the company several years ago and organized the Trumbull Automobile Co., Bridgeport, Conn. He lost his life in the sinking of the *Lusitania* by a German submarine on May 7, 1915. During the last five or six years Henry Trumbull has been in poor health and has more and more retired from active participation in the business, which has devolved almost entirely upon John Trumbull. The secretary of the company is Stanley Gwillim, who has been associated with it for some 15 years.

## WESTERN CENTRAL STATIONS COMPLETE POWER DEAL.

**Pacific Power & Light Co. to Tie In to Large Transmission System of Montana Power Co.**

According to recent press dispatches, the Pacific Power & Light Co., at Yakima, Wash., has completed arrangements with the Montana Power Co. by which the former will tie in to the big transmission line of the latter company at Lind. This connection will practically double the capacity of the Pacific Power & Light Co.'s plant.

The transmission line of the Montana Power Co. extends from near Billings, Mont., to Seattle, Wash., one of the longest in the world. The transmission voltage is 110,000 volts, which will be stepped down to 66,000 volts for use by the Pacific Power & Light Co. It is expected that during the height of the irrigation season the demand will be about 20,000 hp.

## RAILROAD ELECTRIFICATION IN CHICAGO TO BE BEGUN.

**Illinois Central to Electrify Suburban Lines First—Part of Big Lake Front Improvement Project.**

Railroad electrification in Chicago, the largest railroad center in the world, is likely to begin within a few years in accordance with an agreement concluded by the Illinois Central Railroad, the South Park Commission and the Railway Terminal Committee of the Chicago City Council. The Illinois Central suburban lines are to be electrified throughout within 7 years, the remainder of its trackage north of Twelfth street within 10 years, and all the rest of its passenger and freight tracks within 15 years. The ordinance covering this matter relates to it only as one feature of a very extensive improvement, providing, among other things, for filling in a stretch of Lake Michigan about six miles long by one-half mile wide just east of the railroad tracks, this filled section to form an outer boulevard and parkway connecting Grant and Jackson Parks. The railroad's right-of-way will be widened and it will be relieved of the need of protecting the shore line along its tracks. A new terminal depot, to accommodate several other railroads also, is to be built by the Illinois Central south of its present Park Row station, which will be torn down and its site added to Grant Park. Numerous incidental improvements to be made by the railroad will make its total expenditure for the entire project in the neighborhood of $88,500,000. The South Park Commission will expend about $30,000,000 for the park improvements.

Conspicuously located on the lake shore, the Illinois Central Railroad's Chicago terminal lines have been attacked for many years because of the smoke and cinders emitted in front of one of the best residence and hotel districts in the city. Improvement associations, women's clubs and other organizations have sought to force electrification of these tracks. An outcome of this was a movement for railroad electrification throughout the city, involving a total of about 4000 miles of single track. This was dropped some years ago after an exhaustive report by a special commission showed the expense to be extremely high. The Illinois Central negotiations indicate that the city's electrification policy will be to bring about electrification not on a wholesale scale through a general ordinance but by means of special contract ordinances with the individual railroads as opportunity offers. The present ordinance needs the formal approval of the City Council and the Federal Government, which is assured in each case, according to the most reliable reports.

## CO-OPERATIVE COURSE IN ELECTRICAL ENGINEERING TO BE GIVEN.

**Massachusetts Institute of Technology and General Electric Co. Arrange Five-Year Course.**

An electrical course is to be conducted by the Massachusetts Institute of Technology in co-operation with the General Electric Co. and will afford a distinctive training for the technical and executive responsibilities of the manufacturing industries. The course will cover a period of five years, of which the first two are to be identical with the old and well established course in electrical engineering at the Institute, and the last three are to be divided between instruction at the Institute in Cambridge, Mass., and experience associated with instruction at the West Lynn and other works of the General Electric Co. The work of the final year of the course will be of advanced nature, with emphasis laid on the problems of administration, the design and development of the engineering projects, and in creative work such as research. The training at the works of the General Electric Co. is laid out and will be conducted with a view to the maximum educational value and is intimately correlated with the instruction at the Institute.

The co-operative training which occupies the last three years of the course will be entered upon by the new class on October 6, of this year. The successful completion of the course will lead to the degree of Master of Science. The number of men who may be admitted each year is at present limited to forty, and candidates for admission are subject to the approval of both the Institute of Technology and the General Electric Co. Students who have successfully completed the first two years of the electrical engineering course of the Institute of Technology are eligible to enter this co-operative training, and well qualified students who have completed the substantial equivalent at other institutions are also eligible for admission.

While students are at work at the General Electric Co. plants they will receive regular compensation but are to be under supervision of teachers and their work in the shops is to be supplemented by conferences with works department heads in which technical and administrative problems arising at the works will be discussed.

# Commercial Practice

## *Model Farm Electrification—Hospitality of Dayton Utility — Summer Sales by Mail — Summer Appliance Sales*

### ELECTRICITY HELPS PROGRESSIVE IOWA FARMER.

**J. W. Oltrogge, Near Readlyn, Makes Varied Uses of Current Purchased from Distributing System.**

Farmers in Blackhawk County, Iowa, demonstrate emphatically that the use of electricity is just as much a matter of economy and convenience to them as it is to the millionaire in his "model farm." Farmers in this neighborhood on farms of all sizes have electricity

**Barns and Stables Electrically Lighted, As Are All the Farm Buildings.**

lighting their house and buildings, pumping water, grinding feed, and running the dairy machinery. One of the most complete installations is that of J. W. Oltrogge, who lives near Readlyn.

As will be seen from the illustrations, Mr. Oltrogge's buildings are all of first-class construction,

**A Light Over the Garage Door Makes It Easy to Go About at Night.**

and are electrically lighted throughout. Over the door of his garage is a lamp which lights the walk from house to barn, and is controlled from four points. Thus there is no need of a lantern, as the light can be turned on at the house, and extinguished on reaching the barn. In the barn is a 7½-hp. Westinghouse motor driving a Bowser feed mill. Experience has shown just where to set the slide gate in the feed-chute so that the mill gets just enough unground oats and corn, and so it runs without attention. Nearby is a 1-hp. motor belted to a shaft formerly driven by a windmill. This shaft runs outdoors to a pump which delivers to a concrete tank from which pipes run to various watering troughs. One of these troughs which serves the beef animals, is placed in the wall of a shed so that it can be reached from without or within. Formerly there was trouble with this freezing, but Mr. Oltrogge has put in a little electric immersion heater, taking 500 watts, which effectively

**An Electric Range Replaces Coal in the Kitchen.**

keeps the water ready to drink. Since there are about 150 head of cattle the saving of this device is obvious. The motor-driven feed cutter, too, means no hauling of feed over heavy roads, and no shortage of ground feed at any time.

Electricity lightens household tasks too, and Mr. Oltrogge isn't one of these men who keep all the conveniences for himself. His house is well lighted throughout, and has a complete plumbing installation, supplied by a small rotary pump driven by a Westinghouse ⅓-hp. motor. This pump delivers into a 3-ft. by 6-ft. pressure tank. In the laundry is a combined washing machine and wringer driven by a ¼-hp. motor. In summer Mrs. Oltrogge's kitchen is always cool for she uses an electric range. This has three heating units on top and an oven underneath. In winter, too, there is no fear of fuel shortage, and no delay should the range fire go out. Other household equipment is an electric flatiron, a sewing-machine

motor, and an electric vacuum cleaner. In the garage is a motor-driven grinder which keeps tools sharp.

Mr. Oltrogge has a farm of 320 acres, on which he usually feeds 150 head of cattle and 300 hogs. His electricity bill totals $8 to $10 per month. Current

A 7½-Hp. Motor Drives Feed Cutter.

is purchased from Tegtmeier Brothers, who operate a 2300-volt distributing system. As is customary in this community, each user pays for his share of whatever line connects with the nearest distributing line. He also pays for his transformer (in this case a 7½-kw. unit) and protective devices. Tegtmeier Brothers install the meters. The rate for current

A ⅓-Hp. Motor Driving Water Pump in House, for Farm and House Services.

decreases with the amount used, thus making it easy for the farmer to run several motor-driven devices. By their aid it is possible for Mr. Oltrogge with the help of one boy, to take care of his stock during the winter alone and in the summer to concentrate his time on really productive work. The saving from this is very high, reducing not only the cost of farming, but the work of catering to farm hands. The farm of Mr. Oltrogge is one where the housewife's work is reduced to a minimum.

## DAYTON COMPANY'S HOSPITALITY ENJOYED BY 1400.

The Dayton Power & Light Co. held its eleventh annual picnic Friday, June 27, at Overlook Park. It was by far the best picnic ever held by the company. The events during the afternoon were thoroughly enjoyed and a large number of prizes were awarded.

The ball game between the power stations and the office and sales teams was a very exciting contest and was won by the office and sales, score 7 to 6. The F. M. Tait loving cup was awarded to the office and sales, they securing the greatest number of points in the different contests.

The O. H. Hutchings loving cup was awarded to Earl Compton of the meter department, as being the best all around athlete.

Dancing until 11:30 finished out the day. Music was furnished by the Park Orchestra. The committee in charge was Charles Garman, Burt Taylor, Frank Jones, Joe Gunzelman, W. L. Andrews, Richard Wuichet, Frank Kendig, Carrie Daum, Ralph Scherer and Fred Lewis.

## JULY TO BE SEASONAL OPPORTUNITY FOR FLATIRON CAMPAIGN.

With a reduction in electric light rates effective July 1, and a reduction in the cost of the Western Electric 6½-lb. flatiron from $6.50 to $4.90 as incentives—in which the hot weather also is a powerful ally—the Duquesne Light Co., has set out to sell 2500 electric irons during the month of July.

During July, 1917, the company during a similar campaign sold 1776 flatirons. This year they will not be satisfied unless it sells 2500. Every employe is asked to attempt to sell at least one iron, which if they succeed, assures the campaign "going over the top." In the publicity being accorded the campaign special emphasis is being placed upon the fact that the electric flatiron is ideal for the summer months when the temperature is high and the air humid. The cut in price and the lower energy rates are also being featured. The campaign is in charge of P. H. Simon, manager, Electric Shop, Duquesne Light Co.

## ELECTRICITY IN AGRICULTURE GIVEN IMPETUS IN ENGLAND.

The recently issued annual report of the British Conjoint Board of Scientific Societies contained further reference to the proposal of the Committee on the Application of Science to Agriculture that the Board of Agriculture should grant funds for designing, constructing and testing practically an electrical tractor and certain other agricultural machines. On the occasion of a deputation to the permanent secretary it was urged upon him that big electrical developments were to be expected both in the supply of motors for homestead purposes and also upon the land. Sir Daniel Hall gave a sympathetic hearing and agreed that much was to be expected in agricultural operations from the future use of electricity but he thought the time inopportune. If manufacturing firms would set about the design so as to be ready at a later and better moment he would deal with the matter then. Sir John Snell presented a development scheme for the supply of electric power to the farms of a district at Bridlington in Yorkshire, which contained 1177 farms of various sizes.

# Operating Practice

## *Cleanliness of Turbogenerators — Dielectric Losses of Cables — Oil Switch Explosions — Rates of Steam Making*

### SPARKS AS WELL AS ARCS CAUSE TURBO-GENERATOR FIRES.

**Cleanliness Precaution Against One Form of Fire.**

Short circuits internally have resulted in turbo-generators catching fire and destroying themselves. Proper relay protection so that a machine in trouble is quickly isolated and the air supply shut off do much to prevent internal fires starting, or if started, from spreading.

However, not all fires are due to heavy-current arcs. Many result from dust and dirt that has collected in the windings, this accumulation of combustible material acting as tinder to a spark. A spark may occur from a number of causes. On the other hand, a spark will probably do little damage if the surfaces of the windings are clean and free from such materials as oil, dust, grease and pieces of cotton waste, etc., which are combustible and may be inflammable. It is well to take precautions against internal turbogenerator fires. It is well to furnish means for fighting these fires should they take place. But it is also well to make some effort to keep the machines clean internally by conditioning the air—which also increases the capacity of the machine—and by not allowing cotton waste and lint to be used for wiping purposes around these machines. By following these simple precautions sparks will create little hazard.

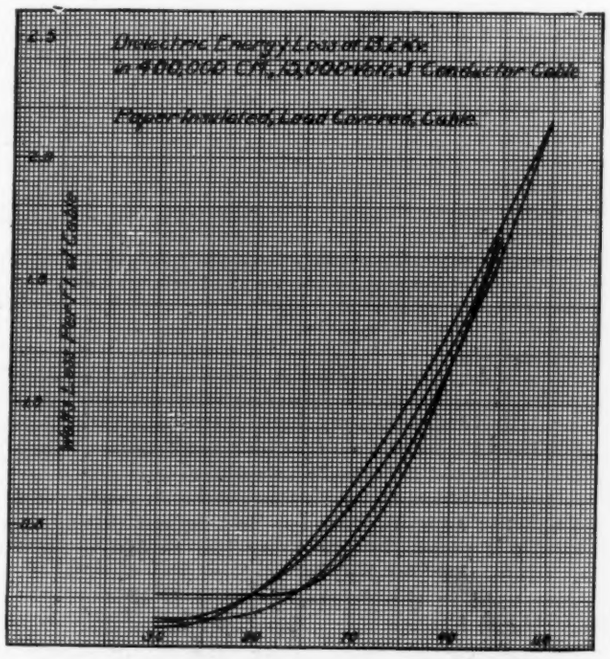
### CLAUSE IN CABLE SPECIFICATIONS CARES FOR DIELECTRIC LOSSES.

**Maximum Dielectric Loss with Temperature Increase Guaranteed.**

Much attention has been given the matter of underground cable rating of recent years because of the growing importance of this phase of transmission and the effect that cable failures have upon life of cables, reliability of service and investment required to give reserve and safe capacity.

It is well known that at the higher potentials, the decrease of dielectric resistance with increasing temperature is such that above a certain temperature, the dielectric losses due temperature are such that although load current ceases, the resistance of the dielectric is such that the losses due the potential through the dielectric are sufficient to cause eventual breakdown resulting from the cumulative effect of temperature upon dielectric strength. One way in which this increasing dielectric loss can be prevented is by keeping within the safe dielectric temperature range. Another method employed is to exceed this limit when necessary and then disconnect the cable from the potential until the cable cools off.

The dielectric properties of a cable decide the safe operating temperatures of that cable and determine at what temperature the cumulative effect of the dielectric loss will cause dielectric failure. One large central-station company has already added clauses to its underground cable specifications requiring cable manufacturers to submit with their bids a table or curve guaranteeing values of dielectric loss that will not be exceeded under various temperature conditions. With this data on hand, and with the help of a temperature survey made of the cable duct routes, it is possible to very closely determine the safe loading of the various cables, in this way obtaining full safe current densities and at the same time reduce cable breakdowns and service interruptions from this cause to a minimum.




**Curves Showing Watts Loss Per Cable-Foot at Different Temperatures. Paper-Insulated, Lead-Covered, 15,000-Volt, 3-Conductor Cable. Applied Potential of 13,200 Volts.**

### OIL FUMES MENACE TO OIL CIRCUIT-BREAKERS.

After repeated operation, such as may occur in closing a circuit several times on a short-circuited line, oil circuit-breakers sometimes blow up. This happens with circuit-breakers operating not only at the higher voltages but also at potentials in the neighborhood of 2300. The cause of these explosions, while they may sometimes be due to the breakdown of the switch bushings, is usually that an oil vapor has collected above the oil, and this, becoming ignited, has resulted in the explosion and the tearing off of the oil-switch tank.

The collection of oil vapor can be prevented by

maintaining a circulation of air above the oil level; this is done in one instance by the use of a vent or valve, which closes before the switch opens. However, for those circuit-breakers where provision is not specially made to prevent the collection of oil vapors, it is a wise measure to refrain from closing them more than necessary in quick succession on short circuit. In any case it is well to examine switch contacts after the switch has repeatedly functioned in rupturing heavy currents.

## FACTORS INFLUENCING RATES OF STEAM MAKING.

**Partitional Hoppers, Stoker Arrangements and Mechanical Draft Are Involved.**

By W. H. De Muth.

With the erratic supply of coal and the inferior and dirty grades available during parts of the war, came many innovations aiming to overcome some of the difficulties involved. One of the greatest difficulties was due to the high dirt and non-combustible content in the coal, a condition that made it extremely difficult to maintain the required steaming capacities of boilers, and radically curtailed overload capacity.

One way of overcoming this situation during the peak load periods that take place almost daily for a comparatively short period, namely, for about 1½ to 2 hours, was to maintain two grades of coal. The grade of coal used during the greater portion of the day was the average run of coal, presumably of inferior quality. The other grade of coal was of better quality, and cost more, of course, and was employed only during such times as specially high rates of steaming were required to take care of sudden peak loads or because certain of the equipment was out of service.

The manner in which two grades of coal have been used, the superior coal for helping out during heavy loads, is generally something like this: On the supposition that mechanical stokers are employed, the coal used in the greater quantity is loaded into the overhead hoppers for general use. The better grade of coal, costing more, more difficult to obtain, and used only for short periods of time, is dumped on the boiler-room floor. A pile is "spotted" at each stoker, in the middle of the boiler-room aisle. When the sudden demand for steam comes on, or just as it is about to come on, the firemen commence shovelling the coal from the floor into the bins immediately above the stokers.

The above practice is followed by many small companies, and also by one of the largest utilities in the country. But the policy is not altogether the best one to follow, as can be shown by the following.

### Two-Part Coal Hopper Has Merits.

At best, in most generating stations only a few of the total boilers installed are required to be supplied with the higher grade of coal. Instead of dumping this coal upon the boiler-room floor in front of these boilers it would be very much preferable to have subdivided coal hoppers—hoppers with compartments in them, for a certain number of the boilers installed. One of these compartments of each hopper could be smaller than the other, if the use of the more expensive coal is not large compared to the use of the inferior grade of coal.

This arrangement has the very real advantage that the good coal is available for any emergency immediately on notice irrespective of men available or maintaining a reserve of firemen, the boiler-room floor is not littered up and difficulties as to moving the coal and dispatching the coals do not occur. With the divided coal hopper both grades of coal can be handled efficiently; both grades of coal are on hand ready for immediate use without calling for any additional outlay of labor.

### Two Types of Stokers Instead of Two Grades of Coal.

However, there is another way of obtaining higher steaming rates than by adopting two grades of coal. Using two different coals complicates plant layout, bookkeeping, labor and the keeping of station data. Moreover, coal deliveries become more complex and station performance is entirely dependent upon two different coal deliveries instead of one, a condition that in this case does not improve reliability but tends to reduce it.

A better way of changing the steam-making capacity of boilers than to resort to two different grades of coal is to employ two different types of stokers. Doing this means that the rates of combustion are changed instead of changing the calorific value of the fuels. Use of two different types of stokers seems to be the scientific method of enabling existing stations to take care of peak loads and emergencies when inferior grades of coal only can be obtained.

For illustration, take a typical example. Many plants are equipped with chain-grate stokers, a type of stoker that employs natural draft, although be it said there are several forms of this stoker now on the market that utilize mechanical draft. A chain-grate stoker is well adapted to burning certain coals. But it also is not able to increase its rate of combustion above a certain limit, about 250%, without getting into trouble and resulting in loss of economy. On the other hand, the underfeed type of stoker is able to go from normal to 300 and even to 400% of rating on short notice and for periods of time that are usually sufficient for the ordinary emergency. A station containing chain grates and underfeeds is flexibly adapted to handle change in coal and change in load.

The use of two types of stokers has many advantages. At the same time such an innovation necessitates considerable expense and takes time. There is still another practice that may be adopted in some cases and one that while being less expensive initially and less radical than the use of two different types of stokers, is also flexible in results. Reference is made to the use of mechanical draft under some of the existing stokers.

A stack is the least flexible way imaginable of controlling draft. One is placed unmercifully at the mercy of climatic conditions. If sufficient draft is furnished to take care of high ratings, by the design of the stack, air infiltration and waste of coal are to be expected at normal loads. On the other hand, a stack designed "close" will be found to introduce serious limitations when higher rates are urgently needed. Mechanical draft makes one independent of the weather and largely immune from troubles incident to varying grades of fuel. It answers immediately to the demands for higher rates of steaming. The most efficient and economical arrangement is that where natural draft can be utilized during normal and light loads and mechanical draft during the heavier loads and forced ratings.

# Contracting-Construction

## *Wiring Ampere-Hour Meter for Tractors — Banks Need Burglar Alarms — Trade Acceptances in Building Work*

### CONNECTING CHARGE-CONTROLLING AMPERE-HOUR METER FOR TRUCK.

**Use of Special Trip Conductor in Charging Plug and Cable to Terminate Battery Charge Automatically.**

Success in the use of electric industrial trucks and tractors depends chiefly on the care that is given to the storage batteries that furnish the current for operation. Of special importance is it to charge the battery completely after it is wholly discharged and yet not prolong the charge excessively after it is time to cut it off; because this means not only waste of energy, but may damage the plates on account of the violent gasing from heavy current at the end of charge. If the truck or tractor has not been heavily used when it comes time to charge it again it will not require as much charge as one that was in continuous use during the day. Consequently there are apt to be various states of discharge among the trucks put on charge at the end of the working day and these trucks should each receive a charge proportioned to the service it rendered since it was last charged.

Doubtless the best way to insure this is to provide on each truck, tractor or industrial battery locomotive an ampere-hour meter with zero contact point. Such a meter has the added advantage that it permits the driver to see at a glance just how many ampere-hours of useful charge he has left in his battery at any time while in service so that he is not likely to run it to exhaustion and be stalled at an unfavorable point. Ampere-hour meters for this service are built so that they record how many ampere-hours have been discharged while the truck or vehicle is in operation. When the outfit is put back on charge the indicating hand proceeds to move back to zero, but at a slower rate than during discharge; this is to compensate for the inefficiency of the battery—that is, because it needs to have more energy put back into it than was taken out during charge. Usually about 15% more charge is needed, in the case of lead-type storage batteries, than was obtained on discharge, although this percentage is usually adjustable within certain limits to permit of an occasional extra long overcharge.

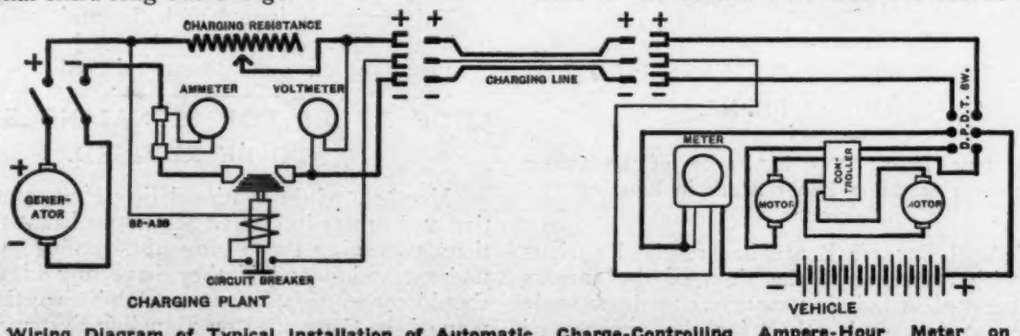
The connection by which this automatic cutoff is obtained is shown in the accompanying diagram. The heavy circuit connected to the meter is the series charge or discharge circuit. Two lighter wires also are connected to the meter. These form part of the potential or shunt trip circuit of the circuit-breaker on the panel of the charging plant. One side of this shunt circuit is connected just below the meter to the opposite side of the main circuit from that to which the other end of the breaker's trip coil is connected. The other light wire in the meter leads to a contact that is tripped when the indicating hand returns to the zero point. When the needle so returns it opens the trip circuit and the breaker then opens the charging circuit. The breaker also serves as a no-voltage cutoff.

In connecting this meter it is necessary to use a three-pole charging plug and charging cable; one wire in the latter and one terminal in the plugs and receptacles may be somewhat lighter, since it serves merely to carry a very small current. The diagram also shows the general method of connecting up the entire charging and vehicle circuits. The diagram was prepared by the Sangamo Electric Co., Springfield, Ill., which has just put out a new type of ampere-hour meter of rugged construction for truck and tractor service, a detailed description of which was published in our issue of last week.

### BANK ROBBERIES SHOW OPPORTUNITIES FOR INSTALLING BURGLAR ALARMS.

**Electrical Contractors Can Come to Relief of Smaller Bankers Who Are Being Victimized by Automobile Bandits—Requirements of Reliable Alarm Systems.**

Numerous bold robberies of banks in the smaller towns and in the outlying parts and suburbs of large cities have again called attention to the need for installation of reliable electric burglar-alarm systems. Only a few years ago, at a time when there was a similar epidemic of handit raids, the Illinois Bankers' Association recommended to its members that they install a good alarm system in each of their banks, since it had been shown that this served in several




**Wiring Diagram of Typical Installation of Automatic Charge-Controlling Ampere-Hour Meter on Battery Trunk, Showing Circuit-Breaker on Charging Panel Controlled by Meter Contact at Full Charge Point.**

cases to scare the robbers before they could seize any booty and caused them to turn and flee in order to escape capture; in other cases it led to capture or shooting of at least part of the gang while they were attempting to escape. Only a week ago a case occurred in Chicago in an outlying bank in which a gang of automobile bandits attempted to hold up the bank, which was well equipped with burglar alarms. The alarm was set off by one of the tellers pushing one of the numerous push buttons without attracting any attention and ringing of the gongs aroused the neighboring merchants as well as scared the would-be bank raiders so that the latter hastily concluded to flee if they were to escape almost sure capture or death.

Some years ago the opportunity for reliable contractors installing dependable alarm systems was pointed out in these columns. It is not necessary to dwell on the value of such systems to banks not otherwise well guarded. Any contractor with a good reputation in the community can readily convince his own banker, if not other bankers of the town, of the importance of having a good alarm system as a safeguard against loss and of not trusting to luck in warding off a bold attack.

A dependable system means, first, a closed-circuit system, because any open-circuit alarm can be too readily put out of order by cutting of the wire at any point on the circuit. As an additional precaution the wiring of the battery and bell sections of the system should be in conduit to prevent tampering. All push buttons, of course, must be of the closed-contact type and be well distributed throughout the establishment so that no matter where the tellers or clerks may be when the raid is attempted or how few attendants there are in the bank at the time it will be possible to operate a button easily and without attracting attention. Obviously, the buttons must be located so that they will not accidentally be pushed, as that would cause needless and annoying alarm.

All alarm bells and gongs should be of big size and continuously ringing type so as to sound a vigorous and prolonged alarm. Preferably, one of them should also be installed in front of the bank, this being a weatherproof gong, of course; this outside gong will serve to arouse the neighbors. If it is not easily possible to connect the system to the police headquarters, it should at least be possible to arrange one, two or more telephones so that the receivers will be pulled off their hooks readily; then the telephone operator will hear the commotion and notify the police, constable or sheriff of the town.

Banks are not the only places that need such protection. Paymasters' offices in factories and other plants, jewelers, stores and other establishments where money or valuables are likely to be kept need similar alarm systems.

## TRADE ACCEPTANCES COVERING BUILDING OPERATIONS.

### Federal Reserve Board Not in Favor of Extending Acceptances to Cover Labor Alone in Building Contracts.

The Federal Reserve Board has received various inquiries with reference to the right of the various parties concerned in building contracts to draw trade acceptances against each other for the purpose of financing the different steps in the process of building.

The Board finds it difficult, if not impossible, to answer any general hypothetical questions with reference to this subject because of the fact that the elements necessary to determine the eligibility of various trade acceptances depend largely not only upon the general nature of the business which they finance, but upon the technical terms of the contract covering the particular transaction out of which they grow. There does not seem to be any doubt that a trade acceptance drawn by a manufacturer or material man upon a builder is eligible for rediscount as a trade acceptance, for that comes clearly within the terms of the Board's definition of such an instrument. It is equally clear, however, that if the nature of the contract under which the building operations are being conducted is such that the contractor, for instance, does not get title either to the materials furnished or to the building as it is being erected, he cannot properly make a trade acceptance of a draft drawn upon him by the subcontractor or builder, because of the fact that he has not been the purchaser of goods sold within the meaning of the Board's regulations.

It is apparent that building contracts vary so greatly in different localities and are always so intricate in their nature that it is impossible to promulgate any general ruling as to the possibility of the use of the trade acceptance to finance structural work and other building operations in general. Each case would have to be determined upon the facts as ascertained in the light of the contract under which the operations are being conducted.

If the drawer of the draft has sold "goods" to the drawee, the drawee may properly accept, and the draft thus accepted would constitute a trade acceptance, if otherwise in conformity with the Board's regulations; but it should be noted that labor in itself is not considered "goods" within the meaning of these regulations. The Board has ruled, however, that a draft drawn to cover the purchase price of goods sold, plus the cost of installing those goods, may be eligible for acceptance as a trade acceptance. (See Federal Reserve *Bulletin* of April, 1918, page 310.) At this time, however, the Board is not inclined to extend the scope of its definition of the word "goods" to include labor alone.

It should be understood of course, that nothing in this ruling should be construed to imply that a note or bill of exchange, the proceeds of which have been used or are to be used for the payment of wages or for services rendered, is not eligible for rediscount. It is merely intended to indicate that in order to constitute a specified preferred class of eligible bills of exchange specially designated as trade acceptances, the transactions out of which the acceptance grows must be one involving the sale of "goods" within the meaning of the Board's regulations.

This ruling is issued with the understanding that trade acceptances should not be used so as to extend the usual and customary terms of credit.

## CODE RULES FOR SIGNALING SYSTEMS TO BE REVISED.

Members of the National Fire Protection Association and others interested are notified that the regulations governing the wiring of signaling systems are under revision and if they have any ideas to offer should communicate them to Ralph Sweetland, chairman of the Committee on Signaling Systems, 141 Milk street, Boston, Mass. These regulations refer especially to Rule 85 of the National Electrical Code.

# Contractor-Dealer

## *Timely Aids to Fan Sales — Mr. Casey Gives Valuable Merchandising Suggestions — Experience of Some Dealers*

### USEFUL IDEAS IN SELLING ELECTRIC FANS.

**Timely Hints for the Dealer Derived from the Experience of the Hydro-Electric Power Commission of Ontario.**

The electric fan is an article which can be used the year around for many services other than the services for which it was originally developed, and the public is gradually learning more and more to use the fan at all seasons. This fact has been emphasized in many issues of the ELECTRICAL REVIEW and we are glad to see it being taken up by other electrical papers. For instance, the *Bulletin* of the Hydro-Electric Power Commission of Ontario says, as an aid to uniform heat distribution in winter the electric fan is almost as valuable as it is to prevent discomfort from the heat in summer. It can be used for drying clothes, photographic plates, vegetables, etc.; for driving steam and odors from the kitchen, refrigerator, closets, etc.; for keeping the frost from show windows, and dozens of other services which make it an article of year-around utility.

From a sales angle, however, the fan is still a seasonable proposition, and can be sold to the best advantage during the one or two hot months of the year only. After the purchaser has obtained his fan, he will use it for many of the extra services for which it is suitable, but in 99 cases out of 100 the appeal which makes the sale and the only one which will do so is the hot-weather-comfort appeal, and, curiously enough, this appeal is effective only right at the time when the prospect is actually experiencing the discomfort of hot weather.

The heat of one day is forgotten the next, provided a cool breeze has sprung up to dissipate the heat, and when one hot day or week has ended in a cool wave, apparently no one ever expects to experience another. So sensitive are fan sales to weather conditions, in fact, that, other things being equal. the sales of fans from day to day will fluctuate in exact ratio to the fluctuations of temperature.

When warm weather is present, every possible means of placing the message of fan comfort before the public should be utilized to the limit. The sales helps furnished by the fan manufacturer should be employed so that every possible user of a fan will get the message in some form. Newspaper advertisements, movie slides, window displays, mailing folders, all available advertising helps should be held in readiness, so that they can be put to work on the first hot day.

These advertising helps should, of course, be supplemented by personal and telephone calls, where the prospects are best for sales. Lists of such prospects should be made up in advance of the fan weather, so they will be ready for use when the hot weather breaks and a hot spell starts in.

Lists should be made up of homes where there are small babies and invalids. These can be compiled from news items in the press and from birth records. Such prospects could be covered by telephone calls. A tactful reference to the value of a fan as an aid to convalescence or as a comfort to the little one, with an inquiry as to whether the prospect would like to have one sent for trial, will bring many trial requests at small expense, and once the fan gets into such homes on trial, the results it shows will usually make the sale.

Small offices, such as the doctor's, dentist's, lawyer's, architects and others, can also be solicited by telephone. A cheery reference to the heat and a request to permit a fan to be sent over to demonstrate how much better the work will go with its help, will usually result in a sale.

Hospitals are excellent prospects, as the fan is a real aid to quick convalescence during hot weather. When the hospital board cannot be influenced by direct salesmanship, often they can be sold through indirect methods. For example, a fan sold or loaned to one private patient in the hospital will make such a strong contrast between the room where the fan is used and others not so equipped, that doctors and nurses will be strongly impressed with the value of fans, and their remarks will help put the message across with the management and directors.

Wherever the fan can be shown in operation, it is always in itself the best possible fan salesman. A demonstration is better than the best verbal arguments of the best salesman. During hot weather the store should be equipped with fans in operation, so that no person can come into the store for any purpose without getting a demonstration of fan comfort. Price tags, counter signs and folders should be arranged about, so as to invite a direct inquiry from the caller before he leaves the store.

The passers-by on the street can be reached in a similar way by having a fan in operation just outside the window or door, so that it directs a breeze toward the sidewalk. A sign near the fan, such as, "If you enjoy this breeze, take it with you. Come inside for particulars," or something of this nature, should be used to clinch the sales message of the fan.

If sales policies will permit it, fans should be sent out on trial at every opportunity. However, in doing this it is very important that they be sent at the right time. On a cool day a fan sent out on trial is effort wasted. On a severely hot day, it nearly always means a sale, as mighty few people are willing to give the fan up when they are enjoying its use.

It is also well to emphasize the low current consumption of the fan by pointing out that it uses no more current than an ordinary incandescent lamp, and that it will not add a noticeable amount to the monthly current bill. Many people imagine, because a fan makes a great stir and commotion in the air, that it must use a lot of current. This impression should, of course, be corrected.

# Better Merchandising—Its Methods and Advantages

## Why Electrical Contractors Should Open Stores—Value of Service as an Advertisement—Advantages of Part-Payment Plans—Selling Hints

By THOMAS J. CASEY

*Vice-President, Hurley Machine Co., Chicago.*

ONE of the greatest problems confronting the electrical industry at the present time is the need for more and better retail stores conducted by wideawake ethical merchants with a reasonably good understanding of electricity and modern business practice. This lack of stores besides not offering any encouragement to the use of electrical appliances in the home, is so great that it makes it difficult rather than easy for the self-convinced customer to purchase them.

And this condition naturally suggests the question, "Why shouldn't electrical contractors conduct retail stores for the sale of electrical appliances in conjunction with their contracting business?" The writer has never heard one real satisfactory reason advanced in answer to this question nor does there appear to be any.

The profits from a properly conducted retail electrical establishment are surely as great, or greater, than those of electrical contracting and in addition are much more reliable and stable and are not subject to seasonable conditions. This is proven by the fact that many contractors who engaged in the retail business simply as a matter of convenience for their customers have since practically discontinued contracting. However, as the amount of detail supervision in connection with a store is small when compared with contracting both can usually be conducted without interference or overtaxing the owner's efforts.

Thomas J. Casey.

One objection that is often raised is that the contractor is not a salesman. If this were true, how does he obtain his contracting business? Doesn't it require better salesmanship and the customer's confidence to a greater extent to secure a wiring contract which is more expensive than an electric appliance and which becomes a permanent part of the customer's home and cannot be exchanged or thrown out? And having thus obtained the customer's confidence by installing satisfactory wiring, is there any reason why he should not capitalize this confidence by selling the appliances to be used in connection with the wiring also? The time has passed when people had their homes wired for lighting only. On the contrary, lighting is becoming a secondary consideration to be enjoyed as a by-product to the many other conveniences and helps that electricity makes possible. The contractor is the logical man to furnish these appliances for he already has the customer's confidence and it is his duty to assist the customer in getting the greatest return on the wiring investment.

### Starting the Store.

In starting the store there are several features that should be carefully considered. The first and most important perhaps is the location. This, of course, is determined largely by local conditions but it should be convenient to the trade and situated so that it can be easily located. In choosing a store special attention should be given to the available show window space and its prominence as compared with those of the adjacent stores.

Next comes the selection of stock. Very often this is done in a half-hearted manner, only a few appliances being purchased at a time, these being of the smaller and cheaper grades. This seldom makes for success nowadays, for the public demands service and will trade only where they can get what they want when they want it. The dealer, therefore, should have a sufficient stock to supply the demand immediately and this should be of a good, dependable quality if he intends to continue in business.

The third feature of the store is its arrangement and attractiveness. The most important part of this is the window displays. The show window is the

direct appeal of the merchant to the passerby for his patronage. If the display is dirty, unattractive and uninviting, that is just the impression the passerby will get of the merchant, his store and his goods. The displays should be changed frequently and if possible should carry some reference to local or seasonable happenings. Considerable assistance can be obtained in this work from the manufacturers and supply jobbers with whom the dealers should co-operate to secure the best results. A great many valuable suggestions and helps can also be obtained from manufacturers and jobbers in the arrangement of the interior of the store. In this respect, however, one feature is often neglected and that is to so arrange the store that customers will pass through as much of it as possible and thus have an opportunity of viewing all the stock. This can easily be accomplished by placing the cashier's desk or any especially attractive goods in the rear of the store.

After deciding on these features the contractor-dealer should turn his attention to advertising and securing publicity for his store, and in this also he will be greatly assisted, if he desires, by the manufacturer and jobber. He should arrange his local advertising carefully, taking advantage of present conditions and tying in with local movements and the advertisements of manufacturers, the local central station and other local dealers.

An illustration of good, timely advertising is shown in the accompanying reproduction of a newspaper advertisement of the Valley Electric Co. of North Yakima, Wash. This advertisement, which was published during the influenza epidemic in the latter part of 1918, pointed out the advantages of the electric vacuum cleaner as a method of combating this dreaded disease. It was explained that the broom only stirred the disease germs up while the vacuum cleaner removed them. The results of this advertisement were especially good, as a very large number of sales were made.

### Good Service, Best Advertisement.

But the best advertising that any establishment can get is from good service and satisfied customers. If the former is rendered, the latter is sure to result. The average American housewife is a natural booster. If the dealer sells her a washing machine, he may confidently expect that she is going to tell her friends and neighbors what she thinks about it. If she is satisfied she will encourage them to buy one also. If the dealer goes one step further and proves to her that he is trying to please and give good service, he may feel sure that she will recommend, in no uncertain way, his store as the best place to buy from.

However, good service means giving the customers what they need when they need it. Not tomorrow, next week or even in a couple of hours, but at the earliest possible moment when the customer, not the dealer, can reasonably expect it. Such service rendered in the event of any trouble occurring removes any thought that the apparatus is defective and instead strengthens the customer's good impression of the dealer.

One frequently hears from contractors or dealers the statement that electrical goods or certain classes of electrical merchandise cannot be sold in their local-

**An Attractive Store Interior Display Arranged to Draw the Attention of Everyone Who Enters.**

ity. After apparently exerting every effort to sell merchandise, they find that the people will not buy electrical goods sufficiently to warrant their keeping in business. Upon investigating, however, it is found that in practically every instance the dealer himself is at fault and when another dealer opens a store in the town with the same or a similar line of merchandise he invariably meets with the success that the first could have achieved had he used the right methods.

When a dealer is confronted with this difficulty, therefore, he should first analyze his own methods and business rather than rebuke the community in which he lives and from which he derives his living. In far too many cases his own estimation of the community can be blamed for his difficulties, for, above all, a dealer to be successful must have faith in his community and try to be its foremost booster. Another recourse which the dealer has in such instances is to

Drive Out the Germs!
Disease breeding germs lie thick in your carpets, rugs and draperies. Especially Now!
Ordinary sweeping simply stirs them up!
But rid of these germs by using a Thor Electric Cleaner!
RED RUBBER BUMPER
ONE THIRD OF A YEAR NOW
Strong, durable. Built of cold rolled steel—welded into one piece—indestructible. So simple a child can operate it!
Red Rubber Bumper saves furniture from accidental knocks.
This cleaner has the famous "Hurley Thread Picker," which picks up all the threads and lint. Started and stopped by convenient switch in handle. Rubber tired wheels. Easy to get into corners.
A wonderful bargain at $31.25.
Balance on Easy Terms
$1.00
Brings You This
Thor
Electric Cleaner
But you must act while this offer lasts. Now—above all times—you need a Thor! Better get one right away. Telephone or come to the Thor Shop at once!
390 Phone for Demonstration! 390
Just phone us and one of our demonstrators will gladly go out to your home with a Thor and clean a whole rug for you, just to demonstrate. No obligation whatever to buy. But phone us at once!
Remember—only $1.00 down and balance on easy terms.
Here's your chance! A chance to make your home cleaning easy! A chance to keep your rugs and carpets beautifully clean the year round while you save all the weary work of sweeping and the nuisance of constant dusting. Come in and see our demonstration in the Thor Shop—or let us show you in your own home. Watch the Thor run over the floor and suck up all the dirt and dust into a bag, all in a jiffy.
Phone or call TOMORROW!
Valley Electric Supply Co.
213 East Yakima Avenue Phone 390
Guaranteed by HURLEY MACHINE COMPANY, Makers of the Famous Thor Electric Washing Machine and Thor Electric Ironer.

**A Timely Newspaper Advertisement That Brought a Flood of Orders.**

appeal to the manufacture or supply jobber who will often be able to solve the problem for him.

### Advantages of Part-Payment Plans.

Another feature which should not be neglected in the conduct of a successful retailing business is the part-payment or installment plan. A great many merchants object to such methods, feeling that it lowers the standing of the store and places their business on a level with the cheap installment house. This contention is exaggerated for, although most inferior goods are on the installment plan, it does not necessarily follow that all goods sold by such methods are inferior. Nor will they reduce the standard of the establishment in the minds of its wealthier patrons because the installment idea has become part of our life nowadays and no matter what a man's financial position may be, he employs it to some extent at least, for example, in paying his rent, etc. Such methods have been employed for years by many of the most reputable concerns, notably in the sale of pianos and talking machines, where the great success that has been achieved is largely the result of the part-payment plan.

The reason for this feeling among the well-to-do class in particular is easily explained. The majority of men give their wives a fixed weekly or monthly allowance from which they are to pay all expenses of running the home, and it is a source of satisfaction to the wife to make this go as far as possible. To make a cash payment for an appliance from this allowance or to save for it before purchasing is a difficulty which the installment plan solves. In addition the part-payment plan makes possible the immediate purchase of goods from the amounts ordinarily carried when customers are seized with the impulse to buy. Such plans should be arranged on, quite easy payments, however, which means that the average monthly payment on articles selling for around $100 should not be more than $10.

The added expense of such plans should be borne by the customer in the form of a slight additional price. Dealers should not be timorous about making such charges for the customers expect to pay them and are skeptical of the value of the goods if they don't have to.

Another advantage of the part-payment plan is that it brings people into the store. Many of the large department stores spent great sums in advertising goods which they sell at little or no profit, simply to attract customers to their places of business, realizing that they will undoubtedly purchase other goods before leaving. When a dealer sells an appliance or device on the installment plan he makes it necessary for that customer to come into his store a certain number of times that he would not have done otherwise, which not only gives the dealer an opportunity to sell him other appliances but makes him more familiar with the dealer, his store, salespeople, and methods which encourages further patronage.

### Sales Hints.

A common fault among electrical dealers is that while they earnestly endeavor to advertise and display their goods to the best advantage, they leave the goods to sell themselves in the store or employ poor methods of selling. This was demonstrated in a western city not long ago.

The dealer in this place was apparently exerting every effort to sell merchandise but with only fair success. His advertising was faultless, his store neat and attractive, he employed the most approved business methods, and a good force of salespeople, but still he did not improve. One of the devices he was not very successful with was the electric washing machine. These were prominently displayed in his store near the entrance, where everyone entering and leaving could not help but notice them. Upon investigation it was found that while a great many people paused to examine these machines, none of the salespeople ever paid attention to them. A salesman was therefore delegated to try to sell those customers who appeared interested but only a little better success was obtained.

Then the salesman's methods were studied. When a customer paused at the washing machine he would approach with the inquestion, "Are you interested?" Invariably the answer was "no" and the customer walked out. The question in itself suggested that answer and also gave the customer the impression

that she was not to look unless she intended to purchase. The fallacy of such methods is apparent. The salesman was instructed to approach the prospects in this manner, "Madam, if you will stand here I'll show you how this machine operates." The customer would unconsciously stand as requested and become more and more interested as the demonstration proceeded. By such methods the dealer's sale of washing machines was increased from barely 15 a month to more than 75 and a similar increase was noticed throughout the store.

Another valuable method is to group appliances that naturally suggest each other by their uses. For example, if during a sale the electric toaster is especially featured, an electric percolator or hot plate or similar appliance should be prominently displayed with the toaster. Or if an iron is featured it should be displayed on top of a washing machine or near an ironer. In this way the salesman in explaining the feature merchandise has an opportunity to demonstrate the others. This often results in the purchase of both, if not at the same time at some later date.

ADVANTAGES OF CARRYING BUT ONE LINE OF MERCHANDISE.

In the writer's opinion it is a mistake for any dealer to carry more than one line of merchandise. By doing so he not only tends to confuse his customers but he is prevented from using his most forceful methods on any of his lines.

For example: A customer enters a store carrying several competing lines of vacuum cleaners, all priced about the same, and in the customer's mind, one as good as another. The customer is confused as he cannot tell which is the best purchase, and the salesman hesitates to center his efforts on any one make for fear of conflicting or condemning some other make that the customer may have secretly decided upon before coming to the store. Furthermore, if the salesman endeavors to push one make too strongly the customer is very apt to think that the profits of that particular make are greater than any other and he therefore can only point out the faults of the various types. In any event, the customer is impressed with the fact that some vacuum cleaners have faults and shortcomings and these probably exist in all of them and decides not to buy.

If on the contrary, the customer goes to a store handling only one line, the salesman can point out the good points of that particular make rather than its poor features without fear of conflicting with any other make. He can explain that this particular type is absolutely the best on the market, in his opinion, otherwise he would not carry it. He can concentrate on that machine, show its operation and advantages and in all probability will make the sale.

However, the dealer should select a line that he can depend on to meet his claims for it, for such a sale carries with it the dealer's recommendation, if not his guarantee, and he is held responsible for its performance. If the machine satisfies, the dealer can feel certain of that customer's future patronage; if not, his store has lost caste as well as the device.

## WHAT CAUSES BLACK SPOTS IN POWER WASHING MACHINES.

Very often women using power washing machines complain of black spots that appear on the clothes that have been washed. These spots are very difficult to remove and usually are found only on the clothes that are washed last, although they may also be found all through the wash.

Many dealers, when customers complain of these spots, blame the soap that is used, but this is usually wrong. The trouble is that the washer is filled too full of water which works into the bearings and loosens the lubricating oil there, causing it to run into the tub, and this causes the spots. The reason the spots are noticed more often near the end of the wash is that the water in the tub, having cooled during the wash, is heated when hot water is poured in without any of the cold water being drawn off.

## MAKING CUSTOMERS APPRECIATE VALUE OF DEALER'S SERVICE.

**Novel Plan Adopted by Contractor-Dealer to Compare His Service with That of Mail-Order Firm.**

It is often a difficult matter to make customers appreciate the value of the service rendered by the local contractor-dealer as compared with the large mail-order house. However, one dealer in a small western city seems to have found a very effective means of keeping trade from going to the mail-order firms, according to a recent account in *Contact,* the Westinghouse Electric & Manufacturing Co.'s publication for its dealers.

This contractor-dealer purchased one of the irons sold by the mail-order firm which he displayed, in the original package, on the counter beside his regular stock of irons. When a prospective purchaser would mention the mail-order iron and its price, he would offer to sell her this iron at the same price as the mail-order house charged, but would insist that the customer purchase it in the package, without opening it, the same as he would purchase it by mail. In this way the value of the service rendered by the dealer was plainly shown, and although he has had the mail order iron for some time and has brought forth this argument very often, it still remains unpurchased and has proved a very profitable investment for the dealer.

## HOT-WEATHER APPLIANCE SALE BY MAIL.

A hot-weather drive on toasters and household irons is being conducted by the Public Service Co. of Northern Illinois in all of the communities it serves. A choice of two irons and two toasters is given the prospect and the appliances are being sent out on the basis of a 10 days' free trial. If retained the price is paid in monthly installments.

An attractive mailing card printed in two colors and giving illustrations and full details of the appliances has been sent to every customer. A self-addressed return post card is provided for the customer, the idea being to conduct the campaign entirely by mail.

## LAMP SALE EXPERIENCES IN NEW YORK CITY.

It has been found in New York City that under proper conditions more incandescent lamps can be sold by the central stations, jobbers, dealers and manufacturers than the central stations were able to dispose of under their renewal or combined sale and renewal policies.

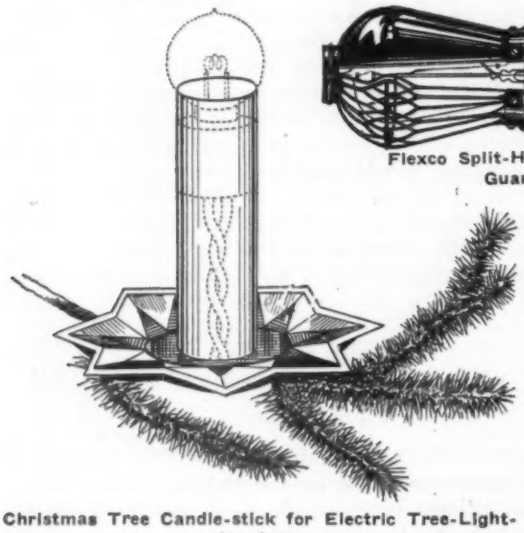
# New Appliances

## *Candle-Sticks for Tree Lamps—Tungar Outfit for Private Garages — Portable Lamp with Reflector — Quad Heater*

### Van Christmas Tree Candle-stick.

It is still quite a long time to next Christmas but wise dealers prepare during the summer for the sale of winter goods. The large demands for Christmas tree lighting sets last year are likely to be very greatly exceeded this year since we are now quite definitely out of the war and decided prosperity is gradually looming ahead. It is therefore the part of prudence to think of the demands of the next Christmas season and prepare for the same in ample time

Many purchasers of electric tree lighting outfits have expressed a desire to have the electric lights, if possible, resemble the old candle for sentimental reasons only. This has been made possible by the development of a candle-stick especially suited to the electric lights usually provided for tree lighting. It consists of a white tube mounted on an ornamental candle tray or reflector on the bottom of which is a spring clip for fastening the outfit to the limb of the tree. These trays are made in four colors, red, blue, green and gold. The candle-sticks are sold in sets of 8, there being two of each of the four colors in each set.



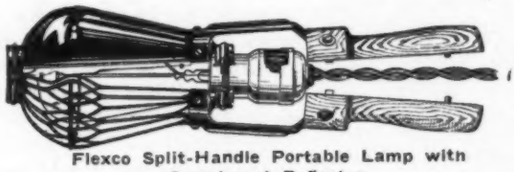
Christmas Tree Candle-stick for Electric Tree-Lighting Sets.

These candle-sticks are easily installed. The lighting outfit is first strung on the tree, then the lamps are unscrewed from their sockets (one at a time) and the sockets pushed up through the tube of the candle-stick to just come flush with the top; the lamp is now screwed back into the socket and the candle-stick complete with lamp is finally fastened to the limb of the tree by the spring clip at the bottom.

The effect is very pleasing, reproducing the old-fashioned candle lighting effect without its fire hazard and inconvenience. Many of these candle sets were used last Christmas and created very favorable comment as well as a demand for more of them. They are made by C. B. Van Antwerp & Co., 26 West Lake street, Chicago, Ill.

### Portable Inspection and Trouble Lamp with Reflector and Guard.

One of the highly efficient conveniences for everyday use in factories, mills, machine shops, foundries, garages, power plants or shops of any kind, is the new Flexco split-handle reflector portable lamp guard, a product of the Flexible Steel Lacing Co., Chicago, Ill.



Flexco Split-Handle Portable Lamp with Guard and Reflector.

In every plant there are innumerable places which make the need of an efficient portable electric light imperative. In engine pits, under machines and automobiles, in warehouse pits and other places not lighted under ordinary circumstances the Flexco split-handle portable carries the light safely and conveniently. This new product eliminates fire hazard because it does away with the careless use of torches and lighted matches in out-of-the-way places where a light is often needed.

The three advantages of this ingenious contrivance—(1) taking the light where wanted because it is portable, (2) protecting the bulb from breakage, (3) reflecting the light away from the eyes of the user and toward the work to be illuminated—make it a very valuable convenience for every shop and plant where light is needed in many unusual places.

The guard is made of expanded steel, well coated with tin. The split handle is adjusted by means of screws, and it hinges with the guard as a base. It clamps over the socket of an extension or drop cord without rewiring. The cord runs through the grooves in the split handle.

This contrivance is another of the popular products of the Flexible Steel Lacing Co., manufacturer of Alligator steel belt lacing, Flexco and Flexco-Lok lamp guards and "High Duty" fasteners for conveyor and elevator belts.

### New Private-Garage Type of Tungar Rectifier.

A new size Tungar battery-charging rectifier has been developed by the General Electric Co., Schenectady, N. Y., for charging storage batteries from an alternating-current circuit.

It has been designed especially to meet the requirements of the automobile owner who desires to charge his starting and lighting battery at home, or in a private garage. Special effort was made to make this device as simple, compact and efficient as possible.

This Tungar outfit will charge:

1 three-cell battery at 5 amperes, 2 three-cell batteries at 3 amperes, 3 three-cell batteries at 1½ amperes, 1 six-cell battery at 3 amperes.

It operates on a standard 115-volt, 60-cycle, alternating-current lighting circuit.

The essential parts consist of a Tungar bulb for rectifying the current, and a transformer for reducing the voltage. Both are contained in a sheet-metal case of attractive design.

This Tungar rectifier operates on exactly the same principle as the other rectifiers of this type.

The operation is very simple. Set the Tungar on the floor, on the running board of the car, or hang it on the wall. Connect the direct-current leads to the battery with the spring clips which are provided and screw the attaching plug into a convenient lamp socket. The Tungar starts charging immediately. It has been approved by Underwriters' Laboratories, and can be safely operated over night without attention.

### New Radiant Air Heater of Quad Type.

American Electrical Heater Co., Detroit, Mich., has added to its line of air heaters a new design known as the "American Beauty Quad." It is an amplification of its twin radiant heater but has four units, two on each side of the standard and superposed over each other. Each unit is rated at 330 watts, making the total 1320 totals. Each pair can be controlled separately. Each unit has its own reflector that can be adjusted within a certain angle.

Since each of the reflectors is of circular outline and approximately parabolic shape, it makes a very efficient means of directing the heat to a considerable distance. Each reflector being separately adjustable, the entire combination affords a convenient means for either projecting the heat over an area or concentrating it at a desired point.

# Trade Activities

## Holtzer-Cabot Electric Holds Sales Convention—Francis Vaughn Manufacturing Organizes — Special Literature

**Electric Furnace Construction Co.,** Philadelphia, Pa., has received an order for an electric furnace for the manufacture of ferro-alloys for Spain, by the Sociedad Espanola de Construccion Naval, the advisory committee of which consists of the firms of Sir W. G. Armstrong Whitworth & Co., Vickers, Ltd., and John Brown & Co. It is said that this is the first furnace of its kind to be erected in Spain for converting their own natural ores into ferro-alloys.

**The Cutler-Hammer Manufacturing Co.,** Milwaukee, Wis., in the Independence Day issue of the C-H Messenger, the house organ of the company, devotes numerous pages to photographs and names of C-H men who served their country during the recent world war. The list includes nearly 300 names and of this number eight men made the supreme sacrifice. This number of the C-H Messenger is gotten up in an attractive manner and is carried out in the national colors.

**The Electric Hoist Manufacturers' Association,** New York City, has issued a very interesting and instructive booklet entitled "Facts for Operators of Electric Hoists," discussing the care and use of electric hoists. This was prepared by the engineering committee and is available to all interested by applying to W. C. Briggs, secretary of the association, 30 Church street, New York City. A new booklet on track, supports, current conductors, etc., will be issued soon by this organization.

**Francis Vaughn Manufacturing Co.,** Milwaukee, Wis., has been incorporated with a capital stock of $50,000 to manufacture electrical and other devices, instruments and appliances. Francis Vaughn, 271 31st street, head of the new enterprise, is senior partner in the firm of Vaughn & Meyer, consulting engineers of Milwaukee and Wausau, Wis., and Minneapolis. He is also business director of the Milwaukee School of Engineering and a leader in electrical affairs in Milwaukee as well as throughout Wisconsin.

**R. A. Nuttall Co.,** Tractor Department, Pittsburgh, Pa., is distributing a booklet devoted to the subject of "pedigreed" gears and serves to better acquaint tractor owners and prospective owners of the need of scientifically designed and constructed gears and will prove helpful in making the selection of a tractor. It contains considerable information on the subject, explaining clearly the difficult work that tractor gears must perform and points out the causes of gear troubles and inefficiency, how inefficient gears waste power, etc. The booklet covers 16 pages and is replete with illustrations.

**Duparquet, Huot & Moneuse Co.,** 108-114 West 22nd street, New York, manufacturer of French ranges, kitchen equipment, utensils and furnishings, has ready for distribution to the trade a new 88-page catalog dealing exclusively with heavy-duty electric cooking equipment for the hotel, restaurant, cafe, factory, club, hospital, steamship, yacht, mansion, sanitarium or kindred institutions.

**Moran & Hastings Manufacturing Co.,** 16-18 West Washington street, Chicago, is sending out a circular on "Raymo" adjustable fixtures designed especially for the office, storage room or factory. Over 1700 of these fixtures have been installed and are meeting the rapidly increasing demand for efficient lighting units. The fixture, heat deflector and fitter are finished in roman gold; the husks, arms and studs are finished in white enamel, presenting a very attractive appearance.

**Automatic Electrical Devices Co.,** Cincinnati, Ohio, has issued Bulletin 615 dealing with the Ogden automatic metallic drum controller (Type NS) for use on storage battery industrial trucks, tractors and locomotives. This type of controller, which was described in our issue of June 28, was designed to meet Government specifications for use in munition plants and the like. It was produced in enormous quantities for use by the War Department. Now that these orders have ceased the company is in a position to furnish these controllers for general commercial use. The bulletin describes the details of construction and the numerous advantages of this type of controller, which has been built especially to withstand the severe service to which this type of equipment is subjected.

**Sales Convention and Outing of the Holtzer-Cabot Electric Co.** — The sales convention of the Holtzer-Cabot Electric Co. was held recently at the home office and factory in Boston. E. R. Harding, vice-president, with four of his Chicago executives, were present, besides the branch managers and other salesmen from various cities. Several important items were discussed each day, including many new and improved devices which were demonstrated by the engineering staff. These meetings have been productive of so much good that it is planned to have them four or five times a year. As the various territories present different aspects of merchandising, the free interchange of opinions is of great assistance to all the selling staff.

The convention was closed by a week-end stay at South Yarmouth on Cape Cod, about 80 miles from Boston. Personally owned automobiles carried a party of 21 both ways along the ideal Massachusetts roads. The opposing teams in all games and contests were captured respectively by E. R. Harding, vice-president, and T. W. Ness, sales manager. All the honors, however, seemed to go to the Westerners. Mr. Harding's team carried off the prize for the bowling tournament by a very close margin. Mr. Harding also took first prize in catching the largest fish. The hard-fought baseball game also went to the Chicago men, although the fans from Washington and New York made a very good showing. The courtesy of Messrs. Schirmer, Sr. and Jr., was extended to the whole party; their two beautiful country homes on the shore were given over entirely for the accommodation and entertainment of the visitors, a courtesy that was much appreciated.

Signal Systems Division of the Holtzer-Cabot Electric Co., Boston.

# Current News

## *Weekly Record of Construction Activities—Conventions*

### EASTERN STATES.

**Portland, Me.**—Considerable electrical and mechanical equipment will be required for the proposed plant to be erected near Portland, by the American Can Co., 120 Broadway, New York, N. Y. Bids for the new plant are now being asked. The structure, with equipment, is estimated to cost about $300,000.

**Lynn, Mass.**—The Board of Water Commissioners has arranged for the erection of a new electric pumping plant at Hawkes Pond, near Saugus, Mass., to cost about $15,000.

**New Bedford, Mass.**—Considerable electrical equipment, including motors, industrial control apparatus, etc., will be installed in the new mill to be erected by the Fairhaven Mills. The structure will be two-story, located on Coggeshall street, and is estimated to cost $100,000.

**Putnam, Conn.**—The Nightingale-Morse Mills, Putnam, Conn., manufacturer of textiles, has awarded a building contract to the H. Wales Lines Co., 134 State street, Meriden, Conn., for the construction of a new hydroelectric power plant to cost about $80,000. The structure will be used for works operation.

**Westerly, R. I.**—A power plant for works operation will be installed by the Rhode Island Silk Co., in connection with the construction of a new mill, estimated to cost about $125,000. The power plant will be one-story, about 40x40 ft.

**Albany, N. Y.**—The state authorities are having plans prepared by State Architect Lewis F. Pilcher for power and boiler plant improvements at a number of state institutions. The work will include a new boiler plant at the Potsdam Normal School, Potsdam, to cost about $100,000; new boilers, stokers and ash handling equipment at the Central Islip State Hosptal, Central Islip, to increase the capacity of the present plant at this location, with cost estimated at $135,000; new generators at the Brooklyn State Hospital, to increase the present capacity, to cost about $15,000; new boilers and auxiliary equipment at the Oneonta Normal School, Oneonta, to cost $10 000; and a new pumping plant at Sing Sing Prison, Ossining.

**Brooklyn, N. Y.**—Brooklyn Rapid Transit Co., 85 Clinton street, has acquired property at the corner of Kent avenue and South Sixth street as a site for the erection of a new electric power station. The property was held at about $350,000.

**Brooklyn, N. Y.**—Mergenthaler Linotype Co., 24 Ryerson street, has completed plans for extensions and improvements in its boiler plant to increase the present capacity.

**Brooklyn, N. Y.**—Long Island Lighting Co. has been granted permission by the Public Service Commission, Second District, to issue bonds for $180,000 and stock for $80,000, the proceeds to be used for extensions and improvements in its plant and distributing system.

**Buffalo, N. Y.**—Robinson-Cataract Electric Co., 151 West Mohawk street, has awarded a contract to the Turner Construction Co., Prudential building, for the erection of its proposed six-story works building at 128-130 South Elmwood avenue. The structure will be 45x115 ft., and is estimated to cost $100,000.

**Glens Falls, N. Y.**—Arrow Grip Manufacturing Co. is planning a new two-story plant to cost $150,000 and is to be equipped for the manufacture of patented grips to secure automobile chains in place.

**Middleport, N. Y.**—Western New York Utilities Co., Inc., is extending its power line to Barker, a distance of 13 miles.

**New York, N. Y.**—A new indirect electric lighting system and other electrical improvements will be made by the South & Central American Commercial Co., Inc., in the portion of the building at 119-121 Pearl street, recently leased for a number of years at a rental of about $100,000 for a new establishment. The company will occupy four floors at the new location.

**New York, N. Y.**—New York Edison Co., 130 East 15th street, has filed plans for the erection of a two-story building, 25x75 ft., at Hester and Norfolk streets, to cost about $35,000.

**New York, N. Y.**—Public Service Commissioner John H. Delaney has made application to the Board of Estimate for an appropriation of $520.000 to provide for the expense of the Public Service Commission for the new quarter to begin July 1. This is an increase of about $43,000 over the amount granted for similar purposes for the quarter just ended.

**New York, N. Y.**—The Up-State Public Service Commission has passed an order authorizing the Long Island Lighting Co. to issue $180,000 5% 25-year first mortgage bonds, and $80,000 in common stock. The proceeds of the securities to be used exclusively for construction and betterments. Address E. J. Phillips, 50 Church street.

**New York, N. Y.**—An electric traveling crane, motors and other electrical equipment will be installed in the new works of Julius Blum & Co., manufacturere of steel tubing, shafting, etc., 532-40 West 22nd street. The company is now located at 510-12 West 24th street, and has secured a long lease on the five-story building at the new location. Alterations and improvements will be made before removal.

**Ossining, N. Y.**—The Catholic Foreign Mission Society of America will build a new power plant at its local institution. A mechanical laundry plant will also be installed.

**Pierrepont Manor, N. Y.**—Northern New York Milk Co. will install boilers, electric power motors and an ammonia ice plant in connection with the milk station, evaporating plant and milk shipping station, which it plans to build. Estimated cost, $200,000. Address F. P. Redfield, Adams.

**Atlantic City, N. J.**—Considerable electrical equipment will be required for the new hotel to be erected by the Ritz-Carlton Co. at Illinois avenue and the Boardwalk, on the site adjoining the Hotel Traymore. The structure will be 12-story, with about 800 sleeping rooms and baths, and is estimated to cost $3,750,000, exclusive of site, which is valued at about $1,000,000. The electrical work will include boiler and refrigerating equipment, mechanical laundry apparatus, fixtures, ornamental lights, etc. The new hotel will be erected by Cramp & Co., Denckla building, Philadelphia, Pa., building contractors.

**Long Branch, N. J.**—The War Department, Washington, is arranging for the purchase of the present site of Camp Alfred Vail at Little Silver, near Long Branch. The property includes about 450 acres, and the consideration is estimated at $125,000. The department has a number of buildings at this location at the present time, and proposes to use the site for an extensive radio station for research and experimental work.

**Newark, N. J.**—Electrical service at the proposed Essex Mountain Sanatorium, now in course of erection by the Board of Freeholders, is estimated to cost about $30,000, including the installation of apparatus, fixtures, etc.

**Newark, N. J.**—In connection with a two-story and basement addition to its plant for increased capacity, the Seton Leather Co., 62 Verona avenue, will build a new one-story boiler plant, about 40x40 ft. The entire improvement is estimated to cost about $40,000.

**Phillipsburg, N. J.**—The City Council in conjunction with members of the local Merchants' Committee, is considering plans for extensions and improvements in the street lighting system. It is proposed to install new standards along South Main street, from Jersey to Jefferson streets, in the business section, and to make similar installations in other sections.

**Pompton Lakes, N. J.**—The new municipal electric power plant has

now been placed in operation under regular service. The borough for some time past has been purchasing electric energy from E. I. du Pont de Nemours & Co., the service being rendered from the electric power plant at its local power works.

**Succasunna, N. J.**—The Township Committee, Roxbury Township, has awarded contracts for lighting the streets of the district to the New Jersey Power & Light Co., Dover; and the Mills Brook Electric Light Co., Netcong. The companies will commence the immediate construction of new pole lines for the installation; about 100 lights will be furnished by the New Jersey company and 55 lights by the Mills Brook organization. A terminal for each utility company will be located at Landing. The roads to be lighted include the main highways from Kenvil to Succasunna, to Ledgewood and to the Lower Flanders Road. The contract calls for the completion of the work and the inauguration of service early in August.

**Trenton, N. J.**—Electric pumping equipment and other electrical apparatus will be installed in the proposed sewerage disposal plant now being planned by the City Commission. The plant will have a disposal capacity of about 25,000,000 gal. of sewerage every 24 hours. The first unit is estimated to cost about $500,000.

**West Orange, N. J.**—Considerable electrical and mechanical equipment, including electric motors, lighting fixtures, switch controls, etc., will be required for the new junior high school to be erected by the Board of Education. The structure will be three-story and basement, and is estimated to cost $290,000. Guilbert & Betelle, 665 Broad street, Newark, are architects.

**Altoona, Pa.**—An electric power plant, ice-manufacturing plant, mechanical laundry and other departments for general service will be erected by the Le Roy Hotel Co., in connection with the complete rebuilding and remodeling of its hostelry. Considerable electrical apparatus, including fixtures, ornamental lights, etc., will also be required for the structure. The new hotel is estimated to cost $600,000. Walter Frieling, Hutchinson building, Altoona, is architect.

**Easton, Pa.**—To increase the capacity of its local plant, the Pennsylvania Utilities Co. has perfected plans for the installation of three new boilers at its local power plant. One of the units will be 1000 hp. and the other two, each 650 hp. They will be provided with auxiliary operating equipment, including Westinghouse type underfeed stokers.

**Homestead, Pa.**—Homestead Gas & Electric Co. has received a contract for electrical work and equipment in the new produce building now in course of erection on Seventh avenue, by G. T. Debolt.

**Meadville, Pa.**—Fire recently destroyed the local car barns of the Northwestern Pennsylvania Railway Company, including electrical and mechanical equipment, with loss estimated at $64,000. It is understood that the structure will be rebuilt.

## DATES AHEAD.

National Association of Electrical Contractors and Dealers. Annual convention, Milwaukee, Wis., July 15, 16 and 17. General manager, William H. Morton, 110 West 40th street, New York City.

Ohio Electric Light Association. Annual meeting, Cedar Point, Ohio, July 15-18. Headquarters, Breakers Hotel. Secretary, D. L. Gaskill, Greenville, Ohio.

Michigan Section, N. E. L. A. Annual convention, Ottawa Beach, Mich., Aug. 19-21. Headquarters, Hotel Ottawa. Secretary-treasurer, Herbert Silvester, Monroe, Mich.

Southeastern Section, N. E. L. A. Annual convention, Asheville, N. C., Sept. 17-19. Secretary-treasurer, T. W. Peters, Columbus, Ga.

International Association of Municipal Electricians. Annual convention, Chicago, Sept. 23-26. Secretary, Clarence R. George, Houston, Tex.

Association of Iron and Steel Electrical Engineers. Annual convention, St. Louis, Mo., Sept. 22-26, 1919. Secretary, John F. Kelly, Empire building, Pittsburgh, Pa.

Washington State Association of Electrical Contractors and Dealers. Annual convention, Seattle, Sept. 11. Secretary, Forrest E. Smith, 205 Boston block, Seattle.

New England Section, N. E. L. A. Annual convention, New London, Conn., Sept. 22-24. Headquarters, Hotel Griswold. Secretary, Miss O. A. Bursiel, Boston, Mass.

National Association of Electrical Inspectors. Annual meeting, Springfield, Mass., Oct. 13 and 14. Secretary, W. L. Smith, Concord, Mass.

Illuminating Engineering Society. Annual convention, Chicago, Ill., Oct. 20-23. General secretary, Clarence L. Law, 29 West 39th street, New York City.

**Philadelphia, Pa.** — Hess-Bright Manufacturing Co. is having plans drawn for a two-story addition, 40x100 ft.

**Philadelphia, Pa.**—The Bureau of Yards and Docks, Navy Department, is planning for extensive additions to the different buildings at the League Island Navy Yard. The Senate has voted to increase the appropriation for the work from $1,500,000 to $3,800 000, making available sufficient funds to carry out the proposed plans. The work will include a new central power plant with electric distributing system, estimated to cost $500,000; a new machine shop for light manufacturing to cost $400,000; new pattern shop, $400,000, and machinery and equipment, including electrically operated apparatus, with improved facilities for handling guns, armor, structural steel, turrets and other items used in connection with shipbuilding and ship fixture work. In the industrial buildings to be erected a large quantity of electrically operated machinery with individual motor drive will be installed. The Bureau has also arranged for the completion of the drydock now in course of erection at a total cost of $4,700,000. Electric cranes, hoisting, handling and conveying machinery will be used in connection with the operation of this dock.

**Pittsburgh, Pa.**—In connection with its welfare operations for employes, the Westinghouse Electric & Manufacturing Co., East Pittsburgh, is building a new two-story and basement lunch room, 100x240 feet, to cost about $40,000.

**Pittsburgh, Pa.**—Duquesne Light Co. will build a new condenser plant and switching station at Carnegie, near Woodville, Pa., to cost about $10,000.

**Reading, Pa.**—Metropolitan Edison Co. has arranged for the remodeling of its former power station at Lebanon into a modern substation for service in this district. The station will be tied in with the new No. 2 high tension line now in course of construction between the main power plant and Lebanon, extending from Reading. This line will provide considerably increased capacity throughout this district.

**York Haven, Pa.**—York Haven Water & Power Co. is preparing plans for a one-story machine shop, 45x65 ft., to cost $25,000.

**Wilmington, Del.** — Hall Radio Corp., Chicago, Ill., a Delaware corporation, has filed notice of change of name to the Hall Research Corp.

**Wilmington, Del.**—The King Street Improvement Association, recently organized for the betterment of this business thoroughfare, is planinng for the installation of new electric light standards on the street. The association is negotiating with the Board of Street and Sewer Directors for the improvement. Charles Topkis is president of the association.

**Baltimore, Md.**—Eastern Rolling Mill Co. has awarded a contract to the General Electric Co., New York, N. Y., for electrical equipment for its proposed works near the Bayview Asylum, Eastern avenue road. Contract for furnaces has been given to George J. Hagan & Co., Pittsburgh. The present plant is estimated to cost about $1,000,000 and will be devoted to the production of steel plates for automobile body manufacture, fenders, etc. It is said that later extensions, now contemplated, with machinery and equipment, will cost about $500,000. J. M. Jones is president.

**Clearspring, Md.**—Local citizens are organizing a company to construct and operate a distributing system for furnishing electric light and power throughout this section. It is proposed to render service at a cost of about 10 cents per kw-hr. Negotiations are under way with the Hagerstown & Frederick Railway Co. to furnish power at high voltage from its hydroelectric power plant on the Potomac River at Dam No. 5. A local substation will be erected to cut down the high-tension electric energy for commercial service.

**Indian Head, Md.**—The Bureau of Yards and Docks, Navy Department, Washington, has under advisement the remodeling and extension of the power plant and will receive bids for electrical machinery.

## NORTH CENTRAL STATES.

**Lebanon, Ohio.**—An election will be held to vote on the question of issuing $120,000 electric light bonds. A complete new plant is necessary. Address village clerk.

**Mansfield, Ohio.**—Plans are being

prepared in the New York office of Henry L. Doherty & Co. for the erection of a new 10,000-kw. turbine at the company's central power station at Melco, 11 miles southeast of Mansfield, which when completed will duplicate the present plant and double the capacity. The new improvement will cost $350,000 and work will begin in 30 days.

**Anderson, Ind.**—Remy Electric division of the General Motors Corp. has adopted a new working schedule. A 48-hour week will be adopted and the employes will receive the same pay as they now receive for fifty hours. The men will work in two shifts, "A" employes working from 6:45 a. m. to 2:45 p. m. and "B" employes working from 3 p. m. to 11 p. m. About 3100 employes are affected by the new working hour schedule.

**Indianapolis, Ind.**—The merger of the Indianapolis Street Railway Co. with the Indianapolis Traction & Terminal Co. has been approved by the Indiana secretary of state and the charter has been issued. The former company has been operated by the Indianapolis Traction & Terminal Co. under a leasehold for a number of years. The capital stock of the new company will be $7,500,000. Directors include Henry Jameson, Charles S. Becker, Walter J. Ball, W. T. Durbin, R. K. Willman, H. C. Thomson, J. A. McGowan, John J. Appel and Robert I. Todd.

**Kendallville, Ind.**—Both Kendallville and La Grange are considering the sale of light and power to South Milford, Ind.

**Chicago, Ill.**—Cole Storage Battery Co. has acquired a building at 2435-39 Indiana avenue for the establishment of a new plant. The structure will be remodeled to accommodate the new works at a cost of $10,000.

**East St. Louis, Ill.**—Fire partially wrecked the plant of the local electric light and power company, causing a complete suspension of business and industrial activity in the city, as well as in Belleville, Alton, Edwardsville and other nearby cities. Repairs were rapidly made and service resumed. The fire was caused by oil on a switchboard becoming ignited and starting a blaze.

**Peoria, Ill.**—Davenport, Springfield & Southern Railway Co. is the name of the new transportation company that is being organized for the purpose of building an electric railroad, connecting the various towns between Davenport, Springfield and Metropolis. H. R. Campbell is chief engineer.

**Vienna, Ill.**—The council is planning to install an up-to-date power plant. Address city clerk.

**Burlington, Iowa.**—A special election is to be held to decide on construction and maintaining municipal light distributing system. Cost, $30,000. Address city clerk, E. P. Weinstein.

**Davenport, Iowa.** — White Lily Washing Machine Co. is building an addition to its plant to consist of two units. The extensions will cost about $165,000.

**New Hampton, Iowa.**—Northeast Iowa Power Co. received permission to construct a seven-mile electric light transmission line south from Fredericksburg. All farmers on the line voted to install the line.

**Oelwein, Iowa.**—Albert E. Green, Detroit, Mich., through his attorney, L. G. Hard, Dubuque, Iowa, has purchased the plant of the Oelwein Gas & Power Co. for $25,000. The property was sold by Lee McNeeley, clerk of the United States Court, who had been appointed special master by Judge Henry Reed. The Oelwein Gas & Power Co. has been involved in litigation for several months, the plant having been closed for failure to pay off its bonds. Mr. Green held the bonds and was successful in securing it. He expects to dispose of the plant.

**Caruthersville, Mo.**—Plans are being prepared by Black & Veatch, engineers, for the complete reconstruction and extension of the water and electric light systems.

**Kansas City, Mo.**—Black Steel & Wire Co. has completed plans for the erection of a new steel plant at its wire rope mill. This plant will consist of two furnaces for making steel ingots, together with electrically driven rolling mills and attendant machinery for the manufacture of steel ingots and rolling into wire road bars and shapes. The plant will have a capacity of 100 tons a day. W. E. Moore & Co., engineers.

**Norborne, Mo.**—Water, Light & Transit Co. has purchased the Norborne fuel, light and ice plant and is planning to furnish the Norborne lighting system with power by a transmission line from Carrollton.

**Sikeston, Mo.**—Election to vote $90,000 in bonds for proposed municipal light plant was defeated.

**Springfield, Mo.**—Springfield Gas & Electric Co. will construct an electric power plant to cost about $100,000.

**St. Joseph, Mo.**—J. W. Squires, Kansas City, Mo., has been commissioned to draw the plans and specifications for the improvements and extensions to the municipal light plant. He will begin at once with the preliminaries. A contract will be drawn allowing him 5% of the outlay for his services, which will amount to $25,000. Actual work will be begun this fall and the work will take between a year and 15 months.

**Green Bay, Wis.**—The city contemplates an ornamental lighting system on streets. Clarence A. Gross is on the committee.

**Duluth, Minn.**—The council adopted Commissioner P. G. Phillips' resolution for a better lighting system. The Duluth Edison Electric Co. will replace arc lights with new units, and will install eight lights to the block.

**Minneapolis, Minn.**—Sales Department of the Minneapolis General Electric Co. during the week ended June 20 secured 320 new electric light and power customers with 188 kw. of lighting and 265 hp. in motors, which includes contract for 150 hp. additional with the Washed Sand & Gravel Co. and 50 hp. with the Phoenix building displacing a steam plant operating the elevators. New business connected to the company's lines shows an increase of 106 customers with 94 kw. of lighting and 46 hp. in motors. A gain of 19% is shown in electric energy output over the corresponding week last year.

**Tyler, Minn.**—The village council is considering the purchase of additional equipment for municipal electric light plant.

**Chanute, Kans.**—An election will be held soon to vote $65,000 bonds for extensions and improvements in the electric lighting system. C. G. Wood, city clerk.

**Hiawatha, Kans.**—New pumps and other improvements are planned for the water system. Estimated cost, $25,000.

**Hudson, Kans.**—The city will vote on the question of issuing $15,000 in bonds for building a transmission line. E. R. Arnold, city clerk.

**Kansas City, Kans.**—The council is planning to expend $50,000 in improving city light plant. Howard R. Payne, city clerk.

**Sharon Springs, Kans.**—Engineers Black & Veatch, 507 Interstate building, Kansas City, Kans., are preparing plans for an electric light plant. Harry H. Wheeler, city clerk.

**Springhill, Kans.**—The electric light plant built five years ago has been closed and current will be furnished from Olathe, a distance of 10 miles from Springhill.

**St. John, Kans.**—The city is having plans prepared for building and extending the waterworks and electric light plant, for which $50,000 have been voted. Burns & McDonald, Interstate building, Kansas City, Mo., engineers.

**Wichita, Kans.**—The city permit has been granted for another unit for the Kansas Gas & Electric Co. plant to cost $275,000.

**Minden, Neb.**—Election to vote $35,000 bonds for lighting plant will be called in the near future.

**Phillips, Neb.**—Bonds have been voted for the erection of an electric transmission system by Grand Island Power Co. Address village clerk.

**Pierre, S. D.**—C. V. Seastone of Mead & Seastone, engineers, employed by the Hydroelectric Commission to make a preliminary survey of the Missouri river, has been here for the past ten days and has had a force of his men at work. The engineers will go over the entire river, and by a system of elimination determine the site which complies with the statutory requirements for the place where most power can be developed for the least money and where the current generated can be transmitted to every part of the state.

**Watertown, S. D.**—Engineer Lewis C. Larson, 18 Hendon avenue, St. Paul, is preparing plans for an electric light and power plant at an estimated cost of $175,000. Brown Mathier, city auditor.

## SOUTH CENTRAL STATES.

**Springfield, Ky.**—Springfield Water & Electric Co. plans to change the plant to alternating current system and install panel switchboard, alter-

nators, engines, etc. H. W. Mayfield, engineer, 298 W. Oak street, Ludlow, Ky.

**Fort Smith, Ark.**—Commonwealth Public Service Corp. will erect in the near future a large central power station in Johnson county near Clarksville. The plant will cost $200,000. Steam turbine engines will be used to generate the power.

**Okemah, Okla.**—Election to vote $23,000 bonds for waterworks improvements and $50,000 for electric light improvements, carried.

**Tulsa, Okla.**—According to Fred W. Insull, president of the Public Service Co. of Oklahoma, a new central power station will be erected for the purpose of generating and distributing electrical energy throughout the territory tributary to and within a radius of 50 miles of Tulsa. The station will be one of the steam turbine type and built to burn either coal or oil, the first of the units to consist of 8000 kw.

**Dallas, Tex.**—A chain of electric flour mills with a capacity each of 50 barrels daily is the plan of the Mutual Milling Co. recently organized here with a capital stock of $100,000. The concern has taken over a mill at Frisco, has built a new one at Grapevine and has had one in operation here for six months. It purposes to erect several more in Dallas and nearby towns. R. S. Fisher, president.

**Dallas, Tex.**—Dallas Power & Light Co. will build a substation here. The company has been granted permission by the city commission to construct a high-tension power transmission line in the proposed substation.

**Luling, Tex.**—The board of commissioners has been petitioned to call an election to vote on issuing $75,000 bonds, the proceeds to be used in constructing a municipal electric light plant and waterworks system here.

**Sherman, Tex.**—Plans have been submitted to the city commission for the erection of a power and light plant which will cost $650,000.

**Waco, Tex.**—O. A. Ryfle of Houston is promoting the organization of the Waco-Temple Interurban Railway Co. for the purpose of constructing an interurban electric railway between Waco and Temple, about 125 miles via the route that is proposed. Other men interested with Mr. Ryfle in the project are J. F. Wright, S. J. McGlasson, E. G. Van Zand and J. L. Davidson, all of Waco.

## WESTERN STATES.

**Grover, Colo.**—A $34,000 bond issue has been voted for waterworks, etc.

**Toledo, Ore.**—The Fisher-Storey sawmill recently destroyed by fire is to be motor driven, power being supplied from a power plant built as a part of the mill.

**Manti, Utah.**—An election will be held to vote on the question of issuing $25,000 electric light and power bonds. Address city clerk.

**Seattle, Wash.**—Seattle has appropriated $1,000,000 for improvements and betterments in the street railway department and to enlarge the Cedar river power plant. The appropriations were for $500,000 for the railway system and $430,000 for the lighting plant.

**California City, Cal.**—The Bureau of Yards and Docks, Navy Department, has authorized the construction of an electric power plant at the naval coaling station to cost about $20,000. Officials at the Mare Island navy yard, Vallejo, will be in charge.

## NEW PUBLICATIONS

**Electrical Characteristics and Testing of Dry Cells.**—The Bureau of Standards, Department of Commerce, has issued Circular No. 79 entitled "Electrical Characteristics and Testing of Dry Cells." This publication covers 44 pages and is divided into five sections. The first section is devoted to a brief discussion of the development of the dry cells and the succeeding chapters deal with the theory and construction of the dry cell; sizes and kinds of dry cells; electrical characteristics of dry cells; and testing dry cells. An appendix giving specifications for dry cells is included.

**The Ultra-Violet and Visible Transmission of Eye-Protective Glasses** is the title of Bulletin No. 119 issued by the Bureau of Standards and prepared by K. S. Gibson, assistant physicist, and H. J. McNicholas, assistant physicist of the Bureau of Standards. This paper presents a report upon the investigation undertaken by the Bureau on spectral transmission of glasses, and deals with the visible and ultra-violet transmissions. Under this investigation 82 samples of eye-protective glasses were studied in regard to their transmission of ultra-violet and visible radiant energy. Four different methods were used to obtain the desired data, part of the work being done in the physical laboratory of Cornell University and part at the Bureau of Standards. A brief summary is given of the good or bad qualities of the various kinds of glass in comparison with colorless glass as regards protection against ultra-violet radiant energy. A brief elementary discussion is given, explaining the meaning of terms used in spectrophotometry and illustrating how to compute the transmissions for thicknesses other than measures. Sample transmission curves are given with all values plotted, illustrating the kind of agreements and disagreements obtained on the different instruments.

## PROPOSALS

**Electrical Equipment.**—The Board of Education, Buffalo, N. Y., is taking bids for electrical equipment, including motors, control apparatus and other industrial appliances for use in the vocational schools during the coming year. Headquarters of the Board are at 1401 New York Telephone building. William D. Fisher, secretary.

**Electric Passenger Elevator.**—Bids will be opened in the office of the Supervising Architect, Treasury Department, Washington, D. C., at 3 p. m., July 31, for the remodeling of an electric passenger elevator in the United States post office, court house and custom house at Providence, R. I., in accordance with the drawings and specification, copies of which may be had at the above office in the discretion of the supervising architect. James A. Wetmore, acting supervising architect.

**Electrical Fixtures, Etc.**—Bids will be received July 28 for furnishing all materials and doing all work necessary to complete the installation of electrical fixtures, lamps, shades, etc., in accordance with plans and specifications for building A. B. C. D. and E. bridge and tower, the industrial arts and power plant group, gymnasium and stadium group of the East Side High Public School building located at Erie and Madison roads, at Cincinnati, Ohio, in accordance with plans and specifications on file at the office of C. W. Handman, business manager, 511 West Court street, Cincinnati, Ohio.

**Drills, Press, Pumps.**—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for 175 electric portable drills, 9/16 inch, 110 volts, universal motor, to be delivered at South Brooklyn, N. Y. (Schedule 4147); a miscellaneous quantity of electric portable drills, two speeds, 125 volts, direct current, delivery at the Philadelphia navy yard (Schedule 4175); one motor-driven trimming press, delivery at Puget Sound, Wash. (Schedule 4172), and 16 main boiler feed turbine-driven pumps for battleships Nos. 49, 50, 51, and 52, and spare parts, delivery at Mare Island, Calif., Norfolk, Va., and Brooklyn, N. Y. (Schedule 4161).

## INCORPORATIONS

**Mt. Auburn, Ill.**—Wurl Electric Light Co. has been incorporated with a capital of $5000, to operate an electric light plant.

**Newark, N. J.**—Newark Electric Repair Co. Capital, $50,000. To operate a local electrical equipment manufacturing and repair plant. Incorporators: J. S. Jaehnig, L. W. Jaehnig, Newark, and F. H. Walsh, East Orange.

**New York, N. Y.**—Challenge Storage Battery Corp. Capital, $50,000. To manufacture storage batteries. Incorporators: G. D. Davis, S. and B. Apostuloff, 123 Manhattan avenue.

**New York, N. Y.**—Multiple Electric Products Co. Capital, $250,000. To manufacture and deal in electrical appliances. Incorporators: J. H. Wallace, Yonkers; E. Frankel, 700 West 179th street, New York, and Andrew C. Knoeller, Jersey City, N. J.

# Personal

## *Bertram Smith Becomes President Automatic Electric Devices—Vinton L. Staley Joins Electric Products Company*

J. P. DAVIS, purchasing agent of the Belden Manufacturing Co., Chicago, has been elected second vice-president of the Purchasing Agents' Association of Chicago.

L. J. DRIGGS, construction engineer of the Pennsylvania Public Service Co., at Phillipsburg, is now construction engineer of the Citizens' Light, Heat & Power Co., Johnstown.

FRED B. GROSS, after 20 months' service overseas with the 77th Division, has been honorably discharged and has rejoined the Plant Engineering & Equipment Co. as advertising manager at the new offices at 192 Broadway, New York City.

LIEUT. LINUS G. KNAPP, formerly employed with the Rochester Railway & Light Co., as statistician, has returned to civil life after twenty-two months' service in the army, and is now in charge of the auditing department of the Genesee Light & Power Co., Batavia, N. Y.

J. W. MCCABE, who until recently was assistant manager of sales for the Chicago Pneumatic Tool Co., Buffalo, N. Y., has been appointed special representative for the company's foreign trade department and will depart shortly for an extended trip throughout the Orient, Philippine Islands and Australia.

LOUIS MARSHALL REAM, Thompson, Conn., who has been engaged in the inspection of wire for the Government at Washington during the war, has been discharged from the service and resumed his duties as assistant superintendent of the South works of the American Steel & Wire Co., Worcester, Mass.

FOSTER CALLAHAN, recently a first lieutenant of Field Artillery in the United States Army, has returned to civil life as representative in several southeastern states of the Safety Insulated Wire & Cable Co., New York. Mr. Callahan formerly covered this territory in another connection and is well known in the electrical industry.

E. T. COOK, formerly a well known electrical contractor, has joined the sales force of the San Francisco branch of the Trumbull Electric Manufacturing Co. Previous to joining the Trumbull company, Mr. Cook was for 16 months overseas with the 26th Engineers, and while in service rose to the rank of master engineer, senior grade.

SAMUEL F. JOOR, a well known consulting engineer of Chicago, has joined the American Steam Conveyor Corp., Chicago, in the capacity of sales engineer. Mr. Joor has had wide experience in the conveyor field, at one time being western manager and sales engineer of the Jeffrey Manufacturing Co. and previous to that time affiliated with the Link-Belt Co.

BERTRAM SMITH has tendered his resignation as assistant vice-president and general manager of the Edison Storage Battery Co., to become president and general manager of the Automatic Electrical Devices Co., Cincinnati, Ohio. In severing his connection with the former company Mr. Smith terminates over twenty years' service in the storage battery industry, having been secretary and treasurer of the Old National Battery Co., which marketed the "Sperry plate." After its absorption by the United States Light & Heating Co., he was for a number of years manager of the western territory with headquarters at Chicago. In 1913 he resigned to become assistant manager of the Edison Storage Battery Supply Co., on the Pacific Coast, with headquarters at San Francisco, and two years later was appointed manager of the Detroit sales district of the Edison Storage Battery Co., Orange, N. J. In this position Mr. Smith established a record for the sale

**Bertram Smith.**

of Edison batteries. In September, 1918, he was promoted to the position of assistant vice-president and general manager, and continued in this capacity until his recent appointment with the Automatic Electrical Devices Co.

GEORGE H. WARING, for the past two years general manager of the Utah Gas & Coke Co., Salt Lake City, has been elected to the office of vice-president and assistant general manager of the American Public Utilities Co., Grand Rapids, Mich., and will have general supervision of all the plants and properties owned by that concern and Kelsey, Brewer & Co. He is one of the foremost gas engineers in the United States and an all around public utility operator of wide experience with a very successful record. Mr. Waring was born at Cement, Bartow county, Ga., in 1871, and was graduated from the Alabama Polytechnic Institute in 1890 with the degree of Bachelor of Science. He entered the gas business in 1892 as cadet assistant to the superintendent of the gas company in Atlanta, Ga. In 1895 he joined the construction engineering force of the United Gas Improvement Co., and superintended the rebuilding of the gas plant at Kansas City, Mo. From 1910 to 1917 he served as vice-president and general manager of the Consolidated Railway & Lighting Co., Charleston, S. C., resigning that position to accept the appointment of manager of the Utah Gas & Coke Co. Mr. Waring was a charter member of the American Gas Institute, the Illuminating Engineering Society and other organizations.

GEORGE ELTZ, after resigning his commission in the navy, has returned to the research laboratory of the Western Electric Co. Mr. Eltz was associated with naval aviation radio.

R. E. BURGER, president and general manager of the Richland Public Service Co. of Ohio, has tendered his resignation to become chief engineer of Henry L. Doherty & Co., public utility operators, New York City.

VINTON L. STALEY, formerly connected with the General Electric Co. as district sales manager of the Edison Lamp Works at Pittsburgh, Pa., has become associated with the Electric Products Co., Cleveland, Ohio, in the capacity of sales engineer. During the war Mr. Staley held a commission as lieutenant in the Chemical Warfare Service, being stationed at Nela Park, Cleveland, Ohio. Since leaving the service he has been connected with the Powdered Coal Engineering & Equipment Co., Chicago, as sales engineer.

EVAN F. JONES has been appointed president and general manager of the Clinton-Wright Wire Co., Worcester, Mass., a merger of the Wright Wire Co., Worcester and Palmer, Mass., the Morgan Spring Co., Miller Wire Cloth Co., National Manufacturing Co., Worcester, and Clinton Wire Cloth Co., Clinton, Mass. Mr. Jones was formerly purchasing agent of the International Harvester Co. in Chicago and later was connected with the Birmingham Steel Co., Birmingham, Ala. About 11 years ago he removed to Worcester, Mass., when he accepted the appointment of general manager of the Morgan Spring

CHARLES W. COLLIER, who for the past 18 months has been overseas in the national service, has returned to this country and has resumed his advertising work in the publicity department of the St. Louis Brass Manufacturing Co., manufacturer of the Brascolite and various other well-known lighting units. Up to two months ago Mr. Collier was in France with a hospital unit attached with the British, and during that time has had various opportunities to study the French and English methods of printing and newspaper production. Mr. Collier was formerly assistant secretary-treasurer of the St. Louis Advertising Club, and later advertising manager of Kline's.

# For the Readjustment Period—What?

*XLIV.*

## Don'ts In Advertising

By J. C. McQUISTON, Manager, Westinghouse Department of Publicity

Don't fail to advertise if you have something to advertise.

Don't advertise just because someone else in the same line does.

Don't leave the copy to the office boy's aunt. She can knit better than she can write advertising lines.

Don't forget that advertising is a part of selling—and selling is no joke.

Don't make statements that you cannot support in practice.

Don't make invidious comparisons.

Don't try to put a full page of copy in a quarter page space. Better put a quarter page of copy in a full page of space. Bull's eye.

Don't fail to give your firm name in the same way—same type—and your address always.

Don't print a circular or folder and then wonder what to do with it. Study your market and write your appeal direct to the market.

Don't overlook the direct appeal to a customer. Don't fail to talk to your prospects in your circular letter, or other correspondence, as you would talk to them face to face. Be natural.

Don't forget to follow up your advertising.

Don't use all the type styles—rather have one dominating style and stick to it.

Don't pick a thin, skinny type—but one that has a bold, courageous face—typical of strong and dependable business.

Don't give more than one bright idea in an advertisement. To do so may endanger your future stock.

Don't express in words what a picture can portray—use illustrations.

Don't run the same advertisement all the time. Change of copy makes your advertisements of continuous interest.

Don't buy space just to please a solicitor. If you do, he will be the sole beneficiary.

Don't overlook the trademark. If you do not have one, make one, and show it in every ad. Also put it on stationery and all apparatus you make, and play up the manufacturer's trademark on goods you buy.

Don't be a spasmodic advertiser. It is the constant dripping of water that wears away the stone.

Don't expect to be able to check definite results. If you have no faith you had better leave advertising alone.

Don't overlook goodwill in your business, and the fact that you can make your advertising create goodwill.

Don't make your appeals in the negative, as "You don't want this" or "You don't want that." The phrasing should be positive and strong, as, "You do need this," and "You do need that."

You should also avoid interrogation if you would make your appeals strong. For example, "Do you not think that it would be well to do this?" "Will you not stop to consider?" The appeal should be positive and direct. "Stop to consider," "Of course you think it would be well to do this or that." Imagine someone approaching you to sell some tickets to a charity supper, and using such an appeal as "You don't want to buy a ticket for this or that." Think how easy it is to say "No." Think, on the other hand, how much easier it is to get the response "Yes" when you say, "Of course you want to help out this or that charity by buying a ticket to this or that supper." The "yes" is almost as sure to come as the "no" is when the negative is used.

Don't think because you know the electrical business that you can also be a top-notch advertiser. The wise business men call in advertising specialists to prepare their advertisements just as they retain attorneys to keep them out of law-suits, and patent lawyers to protect their patent rights.

Finally, don't forget that advertising should portray the sort of a business house yours is. If your advertising be ever so good, indicating order, soundness of credit, promptness of delivery of goods, quality of product, and then in all or some of these things your practice falls short of your claims, the advertising stands out as a glittering lie. Therefore, in what advertising you do, you should strive as earnestly to prove your claims in business practice as to announce them in printer's type.

# Financial News

## Public Utility Ownership.

Paul Tomlinson, financial editor of McClure's, in a forceful article in the July issue of that magazine, says:

"Public utilities commission have been formed in many states to exercise control over privately owned public utilities, and have generally demonstrated that their regulation is beneficial. On the other hand, municipal ownership has proved generally unsuccessful, and is subject to objectionable and harmful political manipulation. The public should realize this fact, if their interests are those affected, and it is a fact that private ownership is ninety-nine times out of a hundred more efficient than ownership by a government, whether of a city or a nation. The case of the railroads proves this. Since the Government took them over rates have gone up, and service deteriorated. The public is paying more and getting less. Most people are beginning to appreciate this, however, and it may be that the present experiment in Government ownership is a blessing in disguise. We are learning that it does not work, and finding it out before all our industries are affected."

"In order that a public utility may expand money is needed, and to get money credit is necessary. It is to the interest of a city and its inhabitants, to see that credit is furnished. There are vast opportunities for increased business for public utilities, but business opportunity must be accompanied by political intelligence to make full realization possible. This is a responsibility which rests in large part upon our citizens, and every citizen of the United States is vitally concerned with public utility companies. Their interests are inextricably intertwined, and public indifference to and ignorance of conditions affecting this class of companies are serious handicaps to their growth and expansion. Cities can scarcely be prosperous without efficient utilities, and, on the other hand, utilities certainly cannot be efficient unless they are prosperous. If the utilities are to be regulated they are entitled to protection."

## Financing Europe.

Competent opinion is now practically unanimous in the belief that the present movement of American goods to Europe and other countries, upon which the prosperity of the United States so largely depends, must soon show a definite falling off unless adequate credit be supplied. The corollary of this belief is obvious; the financial resources of this country must be organized to insure a generous absorption of foreign obligations here. Upon no other basis can business in the present volume be continued.

Banking interests have been studying the problem ever since its nature became evident. It did not appear less formidable with a clearer and nearer view, and the accepted attitude now is that any effort which is made to "finance" Europe must not be that of a single bank or group of banks, but a national movement utilizing the combined energies of finance and industry, with the full knowledge and sanction of the Government.

A tentative program has already been formulated, and at a meeting of the representatives of the leading local financial institutions held last week in the offices of J. P. Morgan & Co., a committee was appointed, headed by Mr. Morgan, on which are Charles H. Sabin, president of the Guaranty Trust Co. of New York; James S. Alexander, president of the National Bank of Commerce; James Brown, of Brown Brothers & Co.; Allen Forbes, of Harris, Forbes & Co.; Alvin W. Krech, president of the Equitable Trust Co.; Jacob Schiff, of Kuhn, Loeb & Co.; James Stillman, president of the National City Bank; Seward Prosser, president of the Bankers Trust Co., and A. H. Wiggin, chairman of the Chase National Bank. Similar action has been taken in Chicago, and is expected in other cities.

These committees will consider in its detail the method proposed by H. P. Davison, which is offered not as a finished plan but as a basis for discussion. In its essence it involves the organization, in each of the large industries—of corporations with full banking powers to trade in stocks, bonds, notes and acceptances, issue debentures based upon these securities, and to conduct all other banking transactions. In order that proper collateral may be obtained it is considered likely that organizations will have to be formed in Europe similar in scope to those proposed here.

## Customer Ownership Participant Finds Way to Build Estate.

A letter from B. F. Wellington, Jr., assistant manager of Western States Gas & Electric Co. at Stockton, Cal., is quoted herewith:

"One of our customers in the purchase of ten shares of preferred stock of the Western States Gas & Electric Co. involving an investment of $1,000, bearing interest at the rate of 7% per annum payable quarterly, has conceived the idea of accumulating a by-account by reinvesting the earnings thus received in the Stockton Land, Loan and Building Association, a local concern with some 1400 members, who own $1,000,000 in savings, dividends and undivided profits. From 32 years past experience of the association the above mentioned preferred stock dividend so invested will net the owner or member at the end of 132 months $770 in savings and $396.65 in profits or dividends, a total of $1166.65, and an estate at that time of $2166.65, more than double the original investment."

## Dividends.

Western States Gas & Electric Co. has declared the regular quarterly dividend of 1¾% on preferred stock, payable July 15 to stock of record June 30.

The board of directors of the Northern States Power Co. has declared the regular quarterly dividend of 1¾% on the preferred stock, payable July 21 to stockholders of record June 30.

The quarterly dividend of 1¾% on preferred stock has been declared by the board of directors of the Ottumwa Railway & Light Co., payable July 15 to stockholders of record June 30.

American Light & Traction Co. has declared the regular cash dividend of 2½% on common stock.

Western Power Co. has declared a quarterly dividend of 1% on preferred stock, payable July 15 to stock of record June 30.

Bell Telephone Co. of Pennsylvania has declared a quarterly dividend of 1½%, payable July 15 to stock of record July 5.

Detroit Edison Co. has declared a quarterly dividend of $2, payable July 15 to stockholders of record June 30.

Manufacturers Light & Heat Co. has declared a quarterly dividend of 2%, payable July 15 to stock of record June 30.

A quarterly dividend of 1¼% has been declared on both the common and preferred stock of the Connecticut Railway & Light Co., payable Aug. 15 to stock of record Aug. 1.

Public Service Co. of Northern Illinois has declared a quarterly dividend of 1½% on preferred stock, also a quarterly dividend of 1¾%, payable Aug. 1 to stock of record July 15.

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

| Public Utilities. | Div. rate Per cent. | Bid. July 1. | Bid. July 8. |
|---|---|---|---|
| Adirondack Electric Power of Glens Falls, common | 6 | 14 | 15 |
| Adirondack Electric Power of Glens Falls, preferred | 6 | 74 | 76 |
| American Gas & Electric of New York, common | 10+extra | 130 | 130 |
| American Gas & Electric of New York, preferred | 6 | 41½ | 41¾ |
| American Light & Traction of New York, common | .. | 263 | 263 |
| American Light & Traction of New York, preferred | 6 | 98½ | 98½ |
| American Power & Light of New York, common | 4 | 73 | 70 |
| American Power & Light of New York, preferred | 6 | 75 | 72 |
| American Public Utilities of Grand Rapids, common | .. | 10 | 10 |
| American Public Utilities of Grand Rapids, preferred | 7 | 38 | 38 |
| American Telephone & Telegraph of New York | .. | 104½ | 104½ |
| American Water Works & Elec. of New York, common | .. | 5 | 5 |
| American Water Works & Elec. of New York, particip. | 7 | 11 | 11 |
| American Water Works & Elec. of New York, first preferred | .. | 59 | 58 |
| Appalachian Power, common | .. | 6 | 6 |
| Appalachian Power, preferred | 7 | 16 | 21 |
| Cities Service of New York, common | +extra | 376 | 410 |
| Cities Service of New York, preferred | 6 | 78⅞ | 79⅜ |
| Commonwealth Edison of Chicago | 8 | 111 | 112 |
| Comm. Power, Railway & Light of Jackson, common | .. | 28 | 28 |
| Comm. Power, Railway & Light of Jackson, preferred | 6 | 63 | 62 |
| Federal Light & Traction of New York, common | .. | 12 | 13 |
| Federal Light & Traction of New York, preferred | .. | 47 | 50 |
| Illinois Northern Utilities of Dixon | 6 | 70 | 70 |
| Middle West Utilities of Chicago, common | 2+extra | 36½ | 36½ |
| Middle West Utilities of Chicago, preferred | 6 | 62 | 60 |
| Northern States Power of Chicago, common | .. | 72 | 71 |
| Northern States Power of Chicago, preferred | ex. div. 7 | 88 | 90 |
| Pacific Gas & Electric of San Francisco, common | .. | 64¾ | 64½ |
| Pacific Gas & Electric of San Francisco, preferred | 6 | 88 | 88 |
| Public Service of Northern Illinois, Chicago, common | 7 | 89 | 89 |
| Public Service of Northern Illinois, Chicago, preferred | 6 | 92 | 94 |
| Republic Railway & Light of Youngstown, common | 4 | 17½ | 17 |
| Republic Railway & Light of Youngstown, preferred | 6 | 58 | 57 |
| Standard Gas & Electric of Chicago, common | .. | 32 | 32 |
| Standard Gas & Electric of Chicago, preferred | 6 | 45 | 45 |
| Tennessee Railway, Light & Power of Chattanooga, common | .. | 6 | 7 |
| Tennessee Railway, Light & Power of Chattanooga, preferred | 6 | 21 | 22 |
| United Light & Railways of Grand Rapids, common | 4 | 49 | 49 |
| United Light & Railways of Grand Rapids, preferred | 6 | 74 | 74½ |
| Western Power of San Francisco, common | .. | 22 | 22 |
| Western Union Telegraph of New York | extra | 88 | 89½ |
| **Industries.** | | | |
| Electric Storage of Philadelphia, common | 4 | 89½ | 98 |
| General Electric of Schenectady | 8 | 163 | 165¾ |
| Westinghouse Electric & Mfg. of Pittsburgh, common | 7 | 56½ | 57½ |
| Westinghouse Electric & Mfg. of Pittsburgh, preferred | 7 | 57 | 57 |